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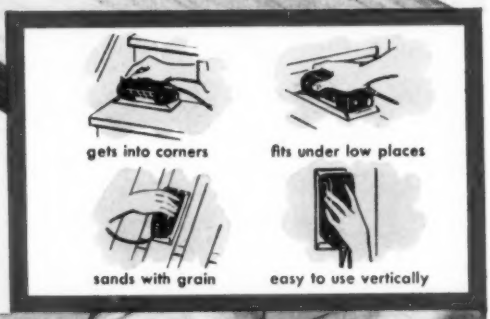

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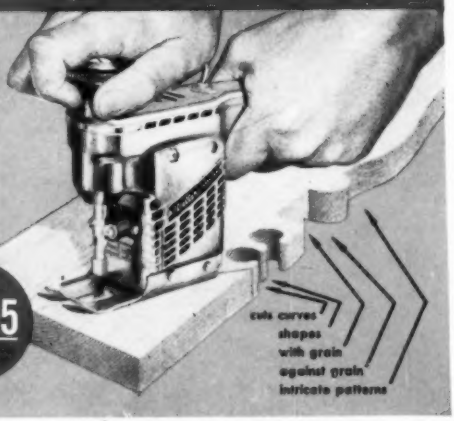

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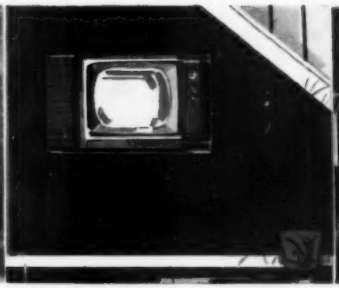

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PS Readers TALK BACK

On Cars Without Wheels

WE ARE completely and utterly pleased by your article on ground-effect vehicles ["Here Come Cars Without Wheels," July]. All of us here in Neponset are highly gratified that we lead the story in PS.

Here is a photo of the 72-hp. conversion of the Aeromobile. Its performance is good, but your observations on grade climbing and dust are accurate.

I believe with greater propulsive efficiency and more horsepower we will climb hills, but for now it's a flat-surface machine. Dust and spray can be conquered, too, with research.

W. R. BERTELSEN, M.D., Neponset, Ill.

. . . Congratulations on "Cars without Wheels." I was very much impressed with your illustrations. Could you send me several reprints of the article? I have found it a quick, handy guide to what is being done in the ground-effect-machine field today.

GABRIEL D. BOEHLER, Pres.
Aerophysics Co., Washington.

Wants to Re-Cast Dice

I HAVE access to a lot of discarded dice from the gaming tables of this city. They're perfect ¾-inch cubes, made of a plastic that can be easily cut or drilled. Thus far, they've only proved useful as souvenirs. Can anyone come up with ideas for some other uses?

RUBIN LEVINE, Las Vegas.

Tip for Car Owners

OTHERS may be interested in a dodge I find prevents mix-ups at the gas pump when various family members use the car. I mark the cap of the fuel tank with the grade of gas I take—Sun 200, Esso Extra, or whatever. I use fingernail polish to print the letters, but masking tape and a ball pen would make changing easier. I find it such a good idea I wonder why gas companies don't issue printed stickers.

J. B. UMHAU JR., M.D., Chevy Chase.

On Beating the Radar

THANKS for the exposé of currently popular systems for beating speed checks ["Why You Can't Fool the Radar Cops," May]. After listening to many drivers extol their pet gimmicks, I am satisfied that they are—as I suspicioned—pure bunk.

A. J. REPAR, Barberton, Ohio.

. . . You say railroad tracks are grounded. No, sir. The steel rails are nailed to wooden cross beams and the wood rests on the road bed. In effect, the steel never touches the ground and is insulated from it by the wood.

JAMES ANDERSON, Santa Rosa, Cal.

Railroad tracks are connected to ground at various points—unintentionally—and the tracks are used as "ground" in railway communications systems.

. . . I'm for radar. I think this is the only way speed arrests should be made. Had I been timed by radar instead of by a young trooper out to make a name for

himself, I would have been clocked at 55 instead of 65 in a 45-m.p.h. zone—and my fine would have been $15 less.

T. T. WOOSLEY, Bristol, Tenn.

. . . The combination of a rather low outline and a fiberglass body seems to make the Corvette somewhat immune to

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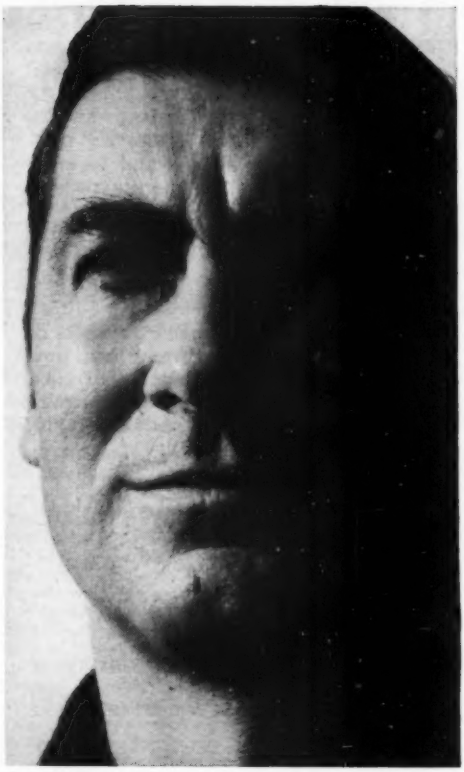

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radar. What happens is that the signal is attenuated on passing through the fiberglass (it won't reflect) and again when reflected from the small car's metal parts. The combination so limits the return-signal level that the receiver may not accurately track its frequency shift.

This peculiar situation could be eliminated, of course, with a more expensive radar installation.

J. L. WEIDENFELD, San Antonio.

Blows His Lid

ONE of the five budget savers [June] says if wax-base shoe polish crumbles or breaks up, hold the can over a low flame on the stove until the wax melts. I tried it and it worked like crazy. The pressure built up inside the can, the lid blew off,

and the stove was showered with messy shoe polish.

Friend, you forgot to remind us to take off the lid.

BILL GOLDMAN, Van Nuys, Cal.

What's in a Name?

JUST read the interesting piece on the Mercedes ["Royal Family of Cars," June] and must point out that the pronunciation you give is incorrect. In German, a C before a vowel is pronounced the same as the Z which, in turn, is pronounced like the English TS (as in pets). Thus, the word is Mer-tsay-dis.

HARRY JABLOW, Jackson Heights, N.Y.

The pronunciation we gave (Mer-say-dis) is the one recommended by Mercedes importers to ease linguistic down-shifting in the U.S.

. . . I'm afraid you'll have to eat your words on the Mercedes.

You say the only U. S. engines that can match the 220 S (in horsepower per cubic inch) are Cadillac's Eldorado, Chrysler's 300E, De Soto's Adventurer. How about the '57 Chevrolet's one horsepower per cubic inch, or 290 horsepower

CONTINUED

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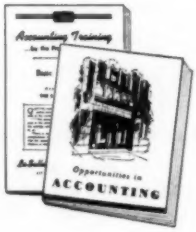

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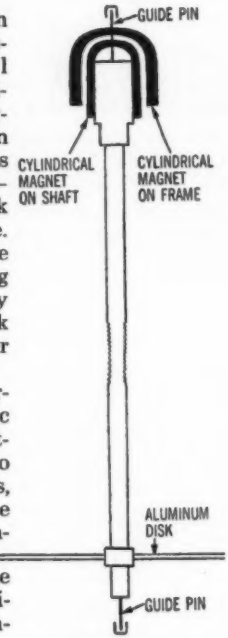
from 283 cubic inches with the optional Duntov cam? Indeed, the Arkus Duntov GM Corvette pulled 310 horses from 283 cubic inches with tuned exhaust.

D. HOLMES, Port Credit, Ont.

Anyway, It Floats



YOUR conclusion [that induced electromagnetism will suspend an aluminum disk in a magnetic field, even though aluminum is nonmagnetic—"Readers Talk Back," June] is true. However, you were wrong in assuming that this is the way the aluminum disk in an electric meter is suspended.

The magnetic bearing in an electric meter uses the attraction between two permanent magnets, one attached to the meter frame, the other attached to the shaft of the aluminum disk (see diagram).

J. H. PARSLEY, Meter Foreman, Texas Elec. Service Co., Ft. Worth.

Better Read It Again

ONE thing puzzles me about hydrofoil boats ["You Can 'Fly' Your Own Outboard," June]. If the speedboat is lifted as much as two feet off the water, don't you need a special shaft on the motor? It seems to me the outboard wouldn't even touch the water if the boat were elevated that much.

JAMES HOSKINS, Williamstown, Mass.

You're right. As mentioned in a caption, a standard shaft extension is necessary to keep the prop in the water.

Dream Comes True

WAY back in 1955, I wrote to you suggesting the use of sightseeing submarines at a proposed World Fair in Florida. Imagine my surprise one day this week

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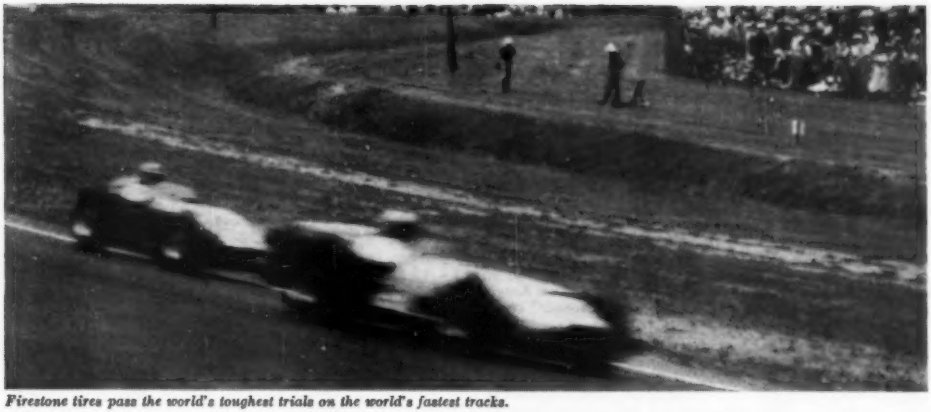

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BETTER RUBBER FROM START TO FINISH

**Firestone Rubber-X is compounded specifically for each type of Firestone tire*

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HP means High Pay
to men who are trained in
Auto Mechanics
Now it's easy to learn quickly at home

"America is short 100,000 auto mechanics," a famous mechanics magazine reports. "America needs 25,000 more auto-repair shops," a noted motor executive announces. *Pay is tops:* In larger cities, it averages $3.00 an hour. *Steady work is assured:* Two-thirds of America's 62 million vehicles are in the "heavy-repair" class.

Why let the lack of training keep you from a better job, higher pay, and lifetime security? No matter if your education is limited—no matter how long you've been out of school—it's easy to learn Auto Mechanics at home in spare time. And, you can *earn as you learn*—many students do.

C.T.I. will train you in: Tune-Up and Overhaul; Electric, Cooling, and Lubricating Systems; Power Steering; Power Brakes; Automatic Transmissions; Clutches; Axle and Chassis Repair; etc. But get all the facts from two booklets we have ready for you. *Be sure to mail coupon today for your free copies.*

Get Experience Using Tune-Up Kit & Tools
(included with training)

CTI sends you a Tune-Up Kit, the kind that skilled mechanics use to locate engine troubles. You receive a compression Tester; Vacuum Gauge & Fuel Pump Tester; Ignition Timing Light; portable steel case. You also get mechanic's tools, including socket set. You acquire *experience* using kits.

DIESEL MECHANICS OR BODY-FENDER REBUILDING

is yours at no extra cost. Only CTI offers this *extra* choice. You get fully-rounded training in all phases of mechanics.

Many Students Earn Money as They Train

by taking part-time jobs in local shops or fixing cars "on their own." Many make enough to pay all tuition and buy extra equipment. Some open shops, become independent.

Get Facts Now—Decide Later

Your future is worth looking into. Get facts on job and business opportunities. Mail coupon today—Commercial Trades Institute, Chicago 26, Ill.

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Mail me your two opportunity booklets: Big Money in Auto Mechanics; and Sample Lesson. Both FREE.

Name_____ Age_____
Address_____
City_____ Zone____ State_____

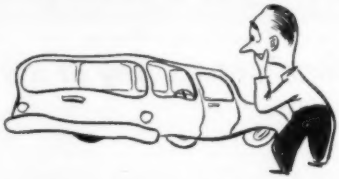
when I picked up a newspaper and saw an ad illustrating just such a submarine. It's now in use at Disneyland.

J. P. ZAMPINI, NYC.

Trade Lingo Throws Him

KEN Fermoyle in his Detroit Report [July] says the Ford people are trying to make next year's Lincoln look "crisper" than the present one. Just what does this mean?

I know that the auto companies use the term in their promotions, along with a lot of other gibberish, but what does PS mean by the word? I'm anxious to know



whether my old ('56) Plymouth station wagon is crisp or whether it has started to wilt.

C. A. RAMBOW, Madison, Wis.

In the lexicon of designers, crisp is believed to mean clean lines, giving a look that depends on configuration and not chrome ornamentation.

A Chance for a Quick Sale

FOR months I've been looking for a machine that was well known only a few years ago, but can't be found now.

What I'm looking for is a Forbiseder—the only machine that can do really good slotsching work. High-priced models had the very useful gasporator attachment. When used with a three-way gasometer, it was one of the most useful machines in any all-around shop.

R. BLAGDEN, E. Hampton, Conn.

Surveys show that Forbiseders are rare. Have you thought of using a hard appleseeder? It does a good slotsching job without a gasporator and the three-way gasometer was just a luxury anyway.

Europe's Ferlac Clutch

ONE of the June letter writers asks what happened to the [Eaton] electromagnetic clutch. By coincidence, the foreign-car quiz in the same issue men-

CONTINUED

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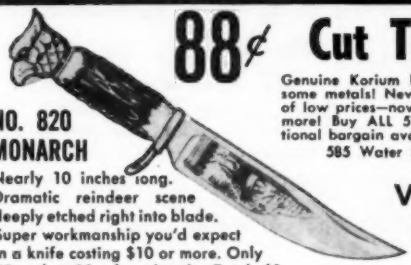

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Nearly 10 inches long. Dramatic reindeer scene deeply etched right into blade. Super workmanship you'd expect in a knife costing $10 or more. Only 88c plus 12c for sheath. Total $1. Order No. 820

VALUES TO $3.95

NO. 84 HELEN OF TROY

Rare work of sculptor's art. Nearly 10 inches long. Color of antique gold with torso of Helen of Troy. Eye-filling design but rugged enough for toughest usage. Only 88c plus 12c for sheath. Total $1. No. 84

88¢

NO. 122 SPORTSMAN

One-piece construction extremely sharp Korium steel blade. Especially good for animal skinning. 8½ inches. Formerly sold for $2.98. Easy-grip handle has a good "feel" to it. 88c plus 12c for sheath. $1. No. 122

One Year Guarantee!

Thoresen backs its products! If, within one year after purchase, any one of these knives proves defective, we will replace the knife with a brand new one.

88¢

NO. 76 BLACK FOREST

World's most famous hunting knife—thousands sold for $3.98! Nearly 10 inches long. Thick Korium steel. A wonderful wall and den decoration, too. Keen, sharp enough to shave with. Only 88c plus 12c for sheath. No. 76

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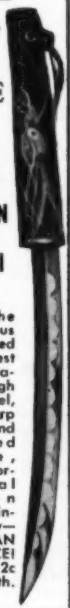

MADE IN THE HIGHEST TRADITION OF SAMURAI CRAFT

Here's the world famous knife crafted in the highest Samurai tradition. High carbon steel, razor sharp blade. Hand decorated handle, matching ornamental wooden sheath. 10 inches. Now—LESS THAN HALF PRICE! 88c plus 12c for sheath. No. 183.

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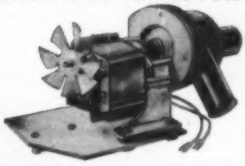

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"I was repairing Radios by 10th Lesson. Now have good TV job." *M. R. Lindemuth*, Fort Wayne, Ind.

"Doing spare time repairs on Radio and TV. Going into full time servicing soon." *Clyde Higgins*, Waltham, Mass.

"I had a successful Radio repair shop. Now I'm Engineer for WHPE." *V. W. Workman*, High Point, N. C.

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tions the Ferlac magnetic clutch used on Renaults. It utilizes a suspension of iron particles in oil congealed by an electromagnet run off the generator.

DR. R. B. STEIN, S. Pasadena.

Don't Lean on It

THE reader who wants an aluminum tent ["I'd Like to See Them Make," June] claims it would reflect the sun to make a cool shelter. I've been handling aluminum irrigation pipe for some time now. After this stuff lies in the sun for a while it gets so hot you can't touch it without gloves.

KIRK STAPLER, Denton, Tex.

Our Bulging Earth?

NOT all scientists agree that the earth has a "slightly pinched" northern hemisphere ["The Month in Science," May]. Geologist J. Lamar Worzel of Columbia University says the northern hemisphere actually bulges out in places. His findings are based on gravity measurements made over the oceans.

During a satellite's trips around the earth, the effects of gravity are averaged. As a result, says Dr. Worzel, some details of shape may be missed.

BILL MITCHELL, Los Angeles.

More on How to Start a Nail

THE letters on driving nails without splitting the wood encourage me to add this bit of lore:

Reverse the nail on the work and hit the point hard enough to set the head in the wood. This cuts the grain. Then drive the nail through the center of the mark made by the head.

MAX MULLER, Sacramento.

New Trick for an Old Cat

OUR cat, Chipper, is smarter than Tang and Gorgon ["A Door That Pets Can Open," June]. He can open doors with no gimmick at all on them, as long as they're unlatched. Now if I can just eliminate the claw marks on the doors, I might invest in Mr. Corey's gimmick—and set up a training course for Chipper.

DAVE LINDSAY, Norwich, Conn.

You'll soon be happy in a great new job...

...earning BIG money...

...if you start training NOW for success in

AIR CONDITIONING AND REFRIGERATION

You could be earning top pay in months. It's mostly a matter of getting your training now. Your best bet is to be a mechanic in the air conditioning and refrigeration field. This industry is growing so fast that *20,000 newly trained mechanics are needed each year.* Over 150 million units are in use; over 5 million new air conditioners, freezers and refrigerators are sold annually. Skilled men are desperately needed for installation and repair work. Be a mechanic! *Mail coupon for free success booklets on CTI's amazing new Home Training Plan.*

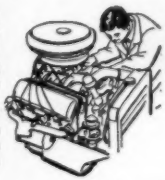
You can earn cash during your training

Because CTI training is so *practical,* you'll soon be making profitable service calls. Perhaps you'll work on your own. Or, you may prefer to get a part-time job with a local appliance dealer or air conditioning contractor. You can add to your present income this way. With extra cash, you can buy additional shop equipment, pay your tuition, even bank money.

You could go in business and be independent

Own a business—and enjoy independence! Thrill to the satisfaction of being the boss. Give orders—not take them! The refrigeration field is ideal for getting started on your own. You can make friends as you make service calls. In time, you'll have a list of potential customers. You can also sign service contracts with food stores, taverns, restaurants, etc. Ever so many CTI graduates have their own successful shops. Most of them began with nothing more than their new training and pluck. You, too, can start small and grow big. Be a business man!

You could get into the profitable new auto air conditioning field



Hundreds of thousands of new cars are being equipped with air conditioners. Auto dealers are advertising for skilled refrigeration mechanics, offering premium pay, to set up service departments. Or, you can go in business for yourself, and contract with auto agencies to do this type of installation and repair. You can make big profits either way.

You learn fast because you practice with real equipment — Get experience

You train at home in spare time. No need to give up your present job; no need to leave home to attend a resident school. *CTI sends 25 kits of parts and tools* to build a heavy-duty, commercial-type, ¼ h.p. refrigeration high-side (illustrated above.) You do 10 trouble-shooting and service jobs—it's almost like field training!

After assembling and working projects with your unit, you may build an air conditioner, refrigerator, freezer, or milk cooler. *All parts and tools are sent without extra charge*—they are yours to use and keep.

You get all these quality mechanic's tools

You get special "tools of the trade" as part of your training. Included is a pressure gauge, vacuum gauge and testing manifold. You'll use these tools to assemble and test the condensing unit. Thus, you get not just tools—*but equipment to practice with.* (Why settle for one without the other?)

You must look into your opportunities

Thousands of CTI graduates (and students) tell us they are getting better jobs, earning more money, working steady. Many are going in business. It is surprising how many report the best benefit of all is that they gained self-confidence. With so much at stake, can you afford to neglect *your* opportunities? Isn't it worth a few minutes of your time to *find out?* Just fill out and mail the handy coupon! Be sure to act today.

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. . . have you heard . . . ?

Pay-as-you-see TV will be tried out in the Toronto suburb of Etobicoke late this fall. It'll be a closed-circuit cable system initially planned to reach 10,000 homes. It will be set up and operated by Trans Canada Telemeter, a division of Famous Players Canadian Corp., Ltd., which owns a big chain of movie theaters. Telemeter hopes to sell the idea to other communities in the U.S. and Canada. The main sales points:

- You pay a flat $5 installation fee for the telemeter unit. That's the only fixed charge.
- Otherwise you pay cash—and only for what you see.
- You can switch from the pay channel to a free one and back again.
- The price you pay will vary with the quality of the program.
- You'll have three programs to choose from on the one pay channel.

The system is broad enough to function as a community station, screening local events, as well as offering such meaty fare as up-to-date movies and championship sports events.

A compulsory fallout shelter? Grim though it sounds, it's possible that you may be required to build one by law. Government planners have issued a booklet called "The Family Fallout Shelter" that offers five plans along with the basic furnishings needed. One of the designs is a do-it-yourself basement project.

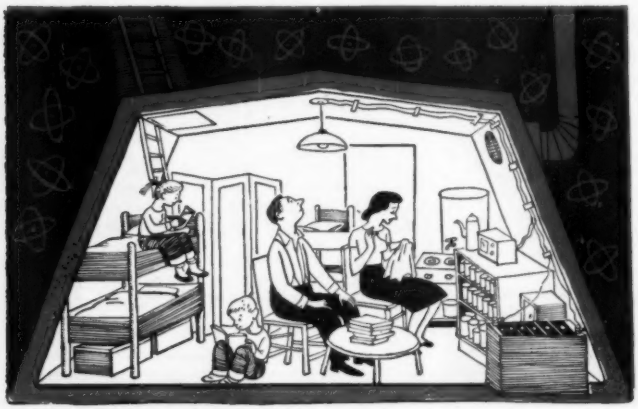
What *are* the "basics"? If building a shelter becomes compulsory, the necessary furnishings will be spelled out carefully. They'll be aimed at making the space livable for a period of at least two weeks.

Planners figure a family of four could be housed in a room with a seven-by-seven-foot floor area. That allows a little more than the 10 square feet per person considered a minimum for comfort. "Basics" will include beds, food, water, sanitation facilities, lighting and a radio.

Toughest problems to crack are the psychological ones. First, the lack of privacy in a confined area. Then the sheer boredom.

Industrial designers Lippincott & Margulies, planning interiors for the atom sub Nautilus, fought the lack of privacy by trying to give each person something of his own. Every sailor had his own storage cabinet, reading light, bulletin board and radio earphones.

To alleviate boredom, the designers experimented with variations in lighting. Both incandescents and fluorescents were used. Switching different ones off and on at intervals helped convey a feeling of the passage of time.



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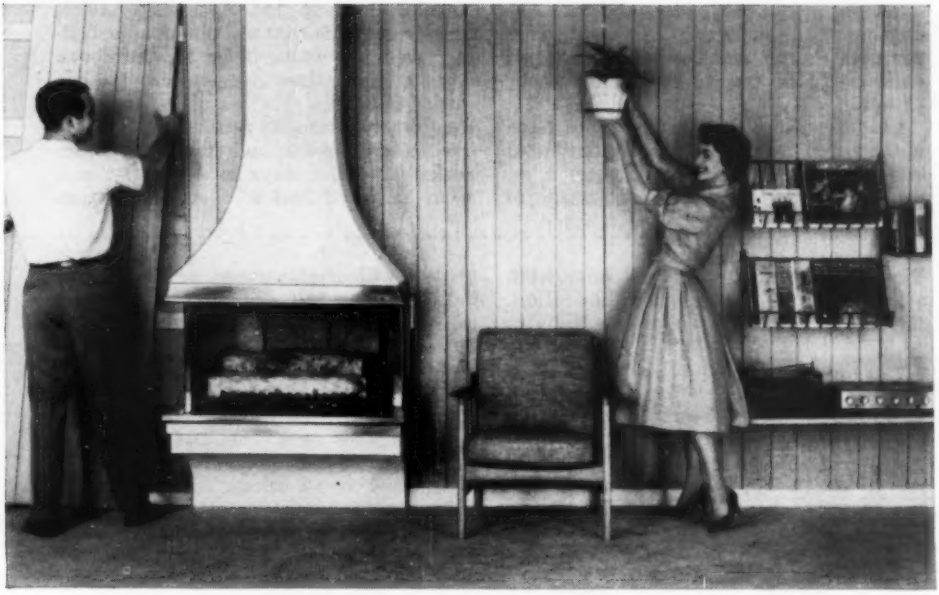
You can install this beautiful wall



Free brochure shows how

This is the exciting new Panelok wall by Masonite. Notice all the items suspended on it. They require not one nail or screw! They are supported by hidden metal lock-strips between the 2′ x 8′ Masonite® hardboard panels. This means you can arrange any of the items in seconds...change a whole room at will! And there's an Adjust-A-Bilt* accessory (planters, racks, cabinets, etc.) for almost any use.

In Four Exciting Colors. Beautiful Royalcote® grained finishes in Misty Walnut, Rosé, Antique and Champagne come in handsome grooved patterns. They add a rich warmth to room settings, enhance any decor. Panels also available unfinished and without grooves.

Free Brochure. We will mail you, *free*, a Panelok wall system brochure showing how easily you can install this exciting paneling —at half the cost you would expect to pay! Panelok and other Masonite hardboards are at your lumber dealer's. Send the coupon today.

*Reg. T.M. U.S. Pat. Off. by L. A. Darling Co.

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...have you heard...?

Both noise and the lack of it are problems in cramped-quarters living. The continuous hum of an air conditioner can give shelter occupants an entombed feeling—but so can the complete absence of noise.

One suggestion is to play tapes on a battery-driven machine that would simulate the normal sounds of living: a refrigerator going on and off; the sound of traffic; wind whistling through the trees.

Color can help, too. Spaceship models have been made that use blue for the ceiling, green on walls, beige for the floors. Not only do they suggest the outside world of nature, but for space travelers they're a reminder of which way is up. In one such setup five volunteers lived contentedly for five days in about as much room as you'd find in a station wagon.

The last word on stains comes from a Department of Agriculture publication. Its title: "Home and Garden Bulletin No. 62, Removing Stains From Fabrics (Home Methods)." You can get it free by writing the department's Office of Information, Washington 25, D. C.

Besides covering the classic or old-time stains, the new edition explains how to deal with modern ones. Among them: ball-point-pen ink, antiperspirants, plastic hangers (they mark clothes), plastic buttons (they sometimes melt into clothes) and some of the newer glues.

Chlorine appears both as stain and stain remover. It yellows some of the newer finishes on cotton, but works fine as a bleach on the older fabrics.

Mustard, of all things, turns out to be the toughest stain—it can never be completely removed from fabric. Lipstick is dismissed as fairly easy—though liquid detergents have replaced glycerine as the proper cleansing agent.

How many Russians are there? The Central Board of Statistics in Moscow made an official count last January. The results, along with sundry other "facts," are interesting to look at:

- The population is 208,826,000—split 55 percent women (115 million), 45 percent men (94 million). World War II losses are still reflected here.
- While 25 cities have populations of over a half a million, only three have more than one million: Moscow (5,032,000), Leningrad (2,888,000) and Kiev (1,102,000).
- Over the last 20 years, urban population has risen from 60 million to 100 million.
- Russia claims the highest marriage rate in the world—more than 12 a year per thousand population; the lowest death rate—7.5 per thousand; and a high birth rate—25 per thousand.

Two tones are better than one. Driving 60 m.p.h., you can see a two-tone car coming toward you a half-mile farther off than a solid-color car, Dr. Harvey Cohen of the Vision Conservation Institute told fellow optometrists.

Tests made by the Institute over a three-state area showed the two-color vehicles were at least 20 percent easier to see than cars painted a solid color.

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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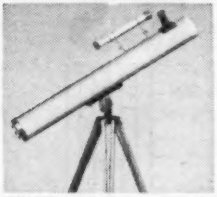

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4¼" ASTRONOMICAL TELESCOPE! UP TO 270 POWER!

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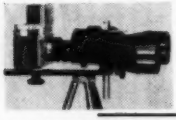

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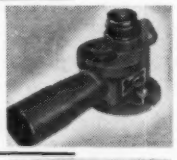

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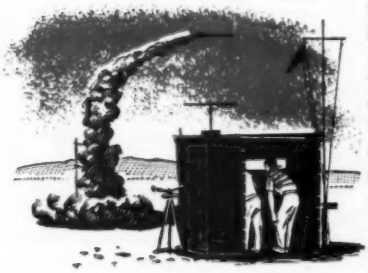
The month in science

Crackdown on amateur rocket shoots? The American Rocket Society, which is to space travel what the American Medical Association is to health, has come out flatly and officially: "The launching of rockets by amateurs must be prohibited. Any loss in [students'] opportunity for intellectual development . . . is small compared with apparently unavoidable and appalling losses of eyes, fingers and lives."

(This statement is a remarkable instance of a reformed sinner's excessive piety: Only 20 years ago the ARS itself was 100 percent amateur. If amateurs here and abroad hadn't kept rocketry going despite professional ridicule during the Twenties and Thirties, satellites and moon probes would still be science-fiction fantasy.)

There is no question that rockets are very dangerous. The ARS reports that, in just five months this year, four amateurs were killed. In a sample period of only six weeks, an estimated 162 were injured, many of them seriously. Anyone who has seen the elaborate precautions that are routine among professional rocketmen is bound to be horrified by the nonchalance with which some teen-agers—and even high-school teachers—mix viciously unstable chemicals, pound them into metal cases and apply matches.



Still, is flat prohibition the remedy for this? There are doubts:

- Small rockets can be made from materials that are easy to get, so prohibition would be harder to enforce than traffic laws.
- Adventurous amateurs would be compelled to experiment secretly, which means without any expert supervision. And that means increased danger.
- Youngsters heading for science or engineering should be encouraged—not discouraged—to experiment.
- Progress might well be hindered, since outsiders frequently come up with the really brilliant new ideas. (It wasn't physicians who discovered disease germs and the antibiotics to kill them.)

The serious hazards involved in rocket experiments obviously call for strict control. In some communities, you need to get a permit—after proving you know the safety rules—just to burn the leaves you rake off your lawn. Surely similar but tougher regulations could keep rocketry within bounds. And no one is better qualified to spell out the necessary controls than the Rocket Society's own experts.

War in space. It looks as if the earth is through as a major battlefield. Any future fighting is likely to occur far out in space, between armadas of satellites and rocketships. The warriors who wield these weapons will be in space, too, controlling them directly and not by pushbutton from land.

That's the look ahead given by the director of the Pentagon's

CONTINUED

The month in science

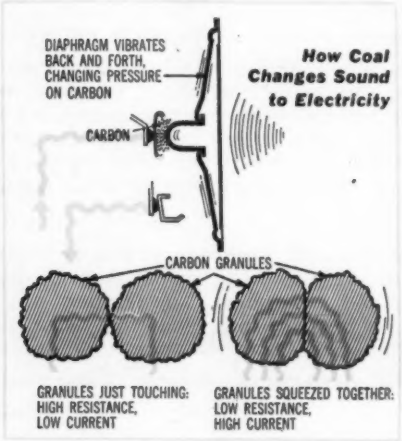
Advanced Research Projects Agency, Roy W. Johnson, in newly released testimony to Congress. Johnson's points:

- We cannot store our defenses—bombs and missiles—on earth much longer because there will be no place to hide them, either on land or on water. Satellites are already able to watch and report much of what we do (see July, "U. S. Space Fence on Alert for Russian Spy-Satellites"). Within 20 years, possibly even 10, the entire globe will be under constant surveillance by all major countries. The Russians will know every time a truck convoy moves here, and we'll be counting barges on the Volga.

- The vastness of outer space is an ideal hiding place. Fleets of missiles and stockpiles of bombs could be dispersed there with nearly zero risk of detection.
- Innocent-appearing satellites, even ones in more or less plain sight, could carry bombs as easily as they can carry research instruments or observation gear.

This is why the heat is on to get real live men into space. Piloted space craft will be needed to maintain and operate the far-out weapons systems, a job too difficult to do via electronics from Earth. Policing the satellite orbits is another job for men. They could rocket up to a strange bird, look it over for bombs and, if necessary, knock it down.

One possibly happy result of this military leap into space: War need not endanger earthbound civilians, at least not directly. It would be a return to the old days—the actual fighting would be restricted and remote, and only the ultimate victory or defeat would affect the folks back home.



Telephone coal. Western Electric finally used up the 800 tons of carefully mined, hand-picked anthracite it bought 30 years ago—to make carbon granules for phone transmitters—and last year had to go out and buy another batch. The coal (from the Mammoth Vein near Hazelton, Pa.) goes through a long and finicky process before it is ready for use. It takes 30 tons of coal to make 3½ tons of carbon granules, but that's enough to fill 9,000,000 telephone transmitters.

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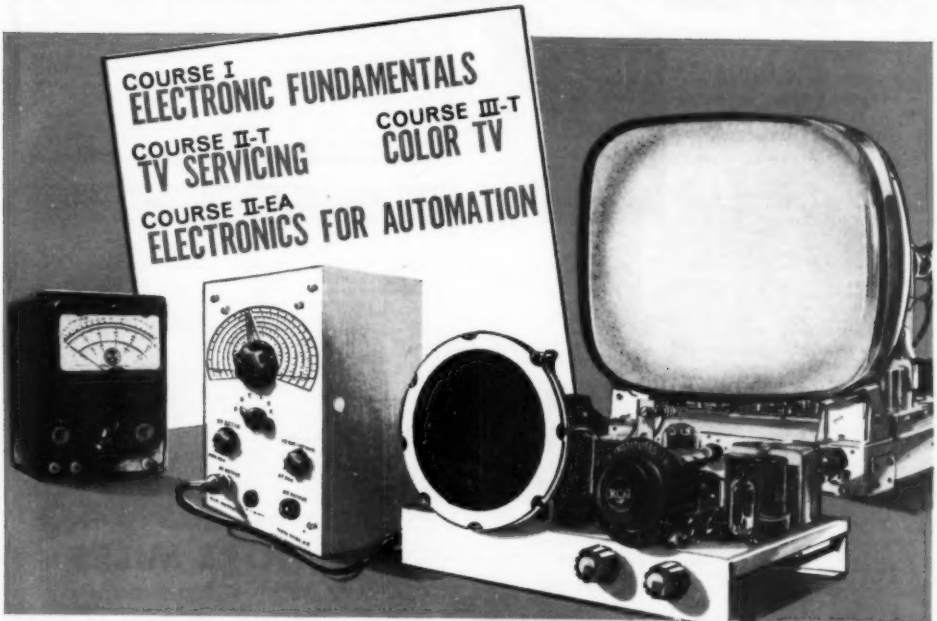

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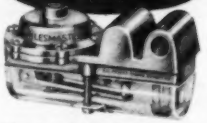

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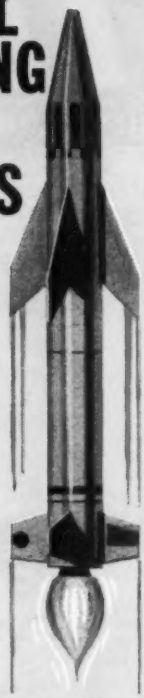

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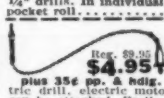

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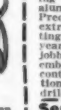

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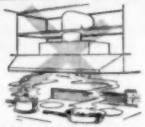

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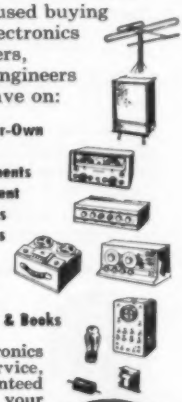

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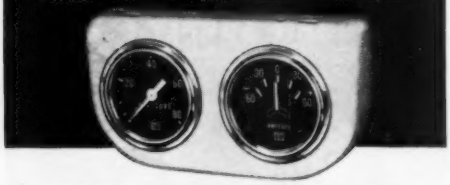

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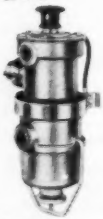

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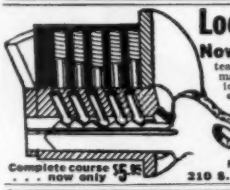

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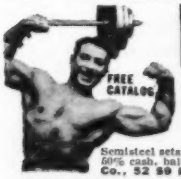

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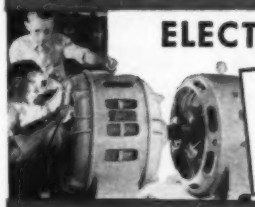

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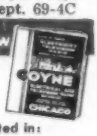

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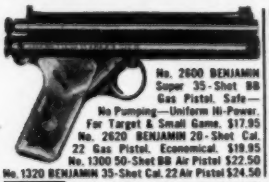

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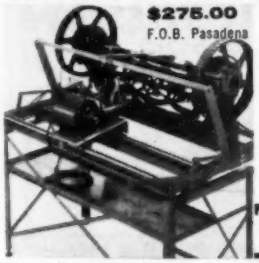

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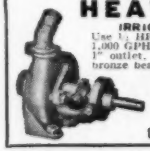

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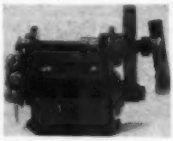

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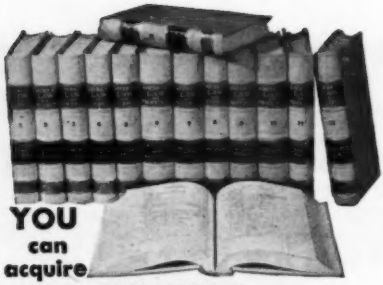

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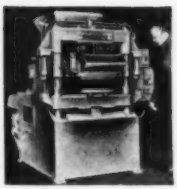

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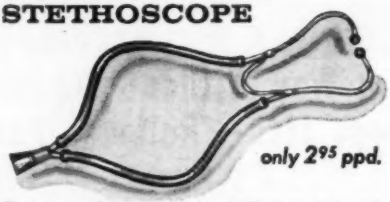

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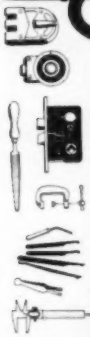

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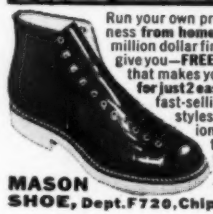

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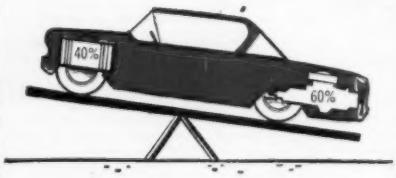
DETROIT REPORT

By Ken Fermoyle *PS Detroit Editor*

Corvair Levels Off at 40/60

Rear-engine war rages. Pot-shots from Ford and Chrysler (whose compact cars will have engines up front) have drawn counterfire from GM. To quash any doubts about the practicality and handling of rear-engine cars, Chevrolet held a press conference for auto writers. Purpose: to brief them on "various aspects" of rear-engine design—with particular reference to the almost-ready Corvair.

Maurice Olley, retired director of Chevy research and development, argued very convincingly for rear engines. Development of tires with adequate cornering power, and an increased supply of aluminum for lightweight engines, were keys to the successful engineering of a compact car, Olley reports. And of course the air-cooled engine eliminates water hoses, water pump and radiator. That helped lick the weight problem, too.



Distribution of Corvair's 2,400-pound weight will be 40 percent on front wheels and 60 percent on rear. This will not vary significantly with different loads.

A tip for future owners: Pressure for Corvair's special tires (on 13-inch wheels) will be critical. Recommended: 26 pounds in rear tires, 15-16 in front.

As for engine accessibility, Olley says: "It's like the Volkswagen—when you open up the rear end, all the machinery is sitting there smiling at you."

Why Buick's drastic sales slump this year? Is it because Buick models switched in "image" too rapidly? Could be. Known for years as a relatively conservative automobile with particular appeal to doctors, businessmen and other solid, conservative buyers, Buick blossomed last fall with radically different, though attractive, styling. Did this alienate a lot of the old faithful, switching the appeal to a younger-in-heart market? And is it just a question of time before this second market starts buying in large quantities?

A straw in the wind: Buick is having trouble building enough convertibles, sold more up to June (11,164) than in all '58 (5,764). Soft-tops are accounting for more than 11 percent of total sales.

CONTINUED

TIRE FACTS THAT CAN SAVE YOUR LIFE

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ARMSTRONG RUBBER COMPANY
Home Office, West Haven, Connecticut

DETROIT REPORT

First Studebaker convertible in nearly a decade will appear as part of the 1960 Lark line this fall. Lark shape and dimensions made quite a chore of styling and engineering a good design. Using a squared-off roof line and semi-blind rear quarter, a la Ford Galaxie, solved the problem.

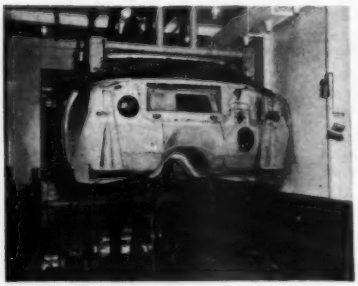
Safety-belt scoffers, hear this! The National Safety Council reports that experts estimate 5,000 lives could be saved annually if seat belts were used in all cars. "Risk of death or serious injury in a wreck is five times greater if you are hurled from the car than if you stay inside—and seat belts help keep you there," reports Ralph Kuhli, director of the Council's Public Safety Department.

A cheaper way to raise gas-octane ratings has been revealed by Esso Research. The new process concentrates on light virgin naphthas, which have the lowest octane of any gasoline component. The method costs an estimated up to 50 percent less than conventional octane-raising.

Chrysler is spending $15,000,000 to protect its 1960 unit-bodied cars against corrosion. This is a problem with any car but it's intensified by unitized construction—if corrosion eats away part of the metal, it weakens the entire vehicle.

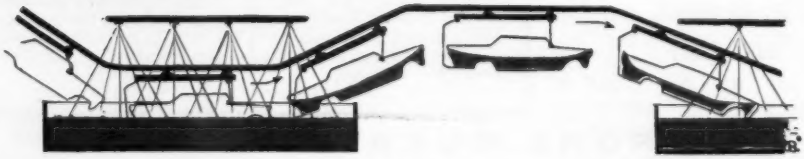
After four years of lab work and field testing, Chrysler engineers have come up with a process they believe will provide two to three times greater corrosion resistance.

Completed steel bodies will ride conveyors, roller-coaster fashion, through a series of seven tanks containing cleaning, rinsing, phosphate-coating and water-reducible primer solutions. These will cover the bodies up to about 18 inches from the bottom.



Upper bodies will be sprayed from overhead nozzles while the cars are moving through all but the primer-coating stage.

The up-and-down conveyors will rise after each dip tank to let the bodies drain 50 seconds. The setup is housed in a 2,300-foot tunnel and it takes each car about 1¾ hours to complete the rustproofing cycle.



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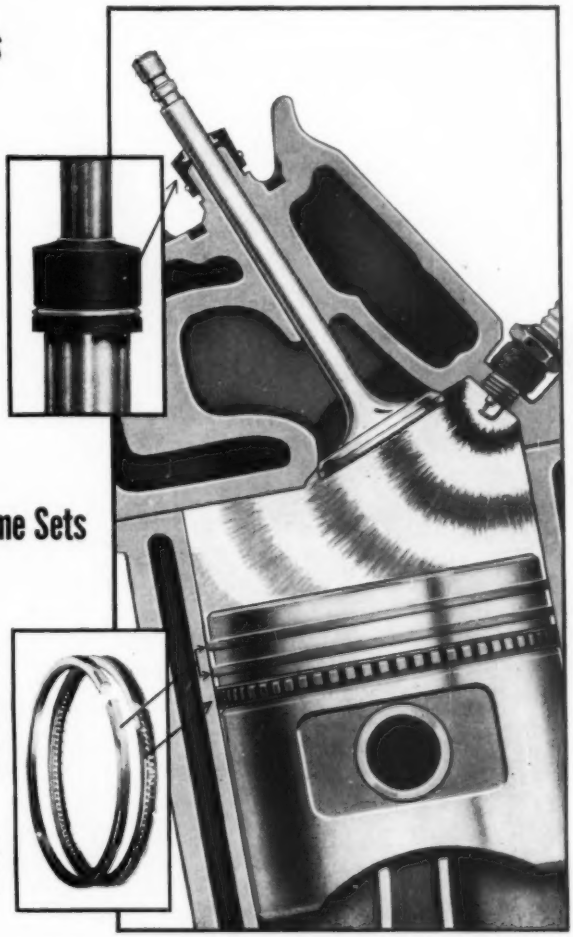

2. Perfect Circle 2-in-1 Chrome Sets

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2-in-1 Chrome sets provide the finest piston rings obtainable! Top rings and oil rings are plated with thick, solid chrome that doubles life of cylinders, rings, pistons. No tedious break-in is necessary, rings are pre-seated at factory.

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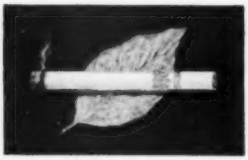

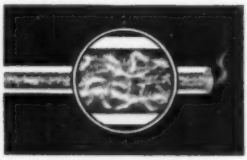

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POPULAR SCIENCE
Monthly

Hidden movie cameras, closed-circuit TV, silent alarm systems—and snoopier guards—are the newest weapons for

Stopping the Wave of Bank Holdups

Camera catches would-be robber

This blurred shot records an attempted robbery in a Linden, N. J., bank. The capped man had just handed a teller a note threatening to kill him unless he handed over all his fives, tens, and twenties. The teller tripped a movie camera instead. The man fled. Soon police were checking the film against their files, releasing copies for TV news shows.

By Joan Steen

BANK robbery—a chancy, immoral, though possibly exhilarating way to obtain money—is increasing spectacularly. There were 416 such robberies in the U. S. last year, 50 percent more than in 1957. So far this year the rate is even worse, running 25 percent higher. That means an average of 10 holdups a week, every week in 1959.

Are there new recruits to robbery? Are the Dillinger days coming back? Are banks themselves too easy to knock off? Police say yes—to all three questions.

What's being done about it? FBI agents, bank security officers, police, and equipment manufacturers have been meeting for months. Some of their recommendations:

- Make banks look more like the impregnable fortresses of the old days.
- Make them tougher inside. Install better alarm systems, and new vault re-

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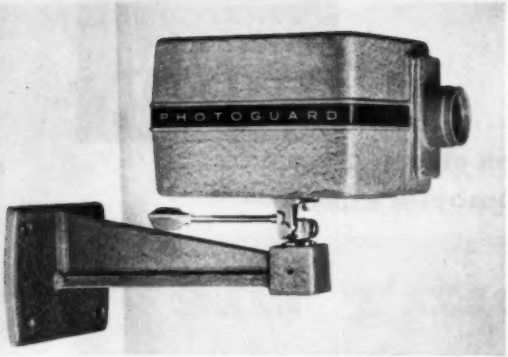
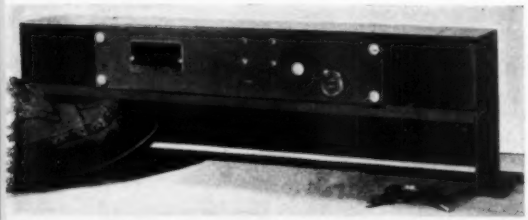


MOSLER'S PHOTOGUARD CAMERA looks like this when it's not camouflaged and made part of a bank's decor. Besides being small and silent, it's bullet-, rust- and tamper-proof.



A TELLER CAN TRIP AN ALARM by kicking his toes up inside this foot rail, also made by Mosler. The lock and a visual indicator are precautions against tampering or false alarms.

THAT COULD BE A MOVIE CAMERA up there near the bank's entrance. But maybe not. Sometimes a bank has a couple of such installations: one for the real thing and one for show.

locking devices. Equip more banks with new gear such as hidden cameras and closed-circuit TV.

- Educate employees. Train tellers to be cool and observant. Let bank guards be armed and snoopy, not just floorwalkers.
- Give the new security systems plenty of publicity.

The current bank crime wave didn't build up overnight. Police have learned to expect a crime increase after a major war. There are surplus weapons around and people who know how to use them. Add to that the recession; even a mild one boosts the crime rate. And surprisingly enough, it stays high after recovery. To these, add another factor, which some enforcement officials term a general laxity on the part of banks.

Conditions were ripe for a crime wave. In increasing numbers, lawbreakers tried their luck, and things started to snowball. Amateurs played a big part: According to the American Bankers Association, 70 percent of those 416 robberies last year were pulled off by persons with no serious police record.

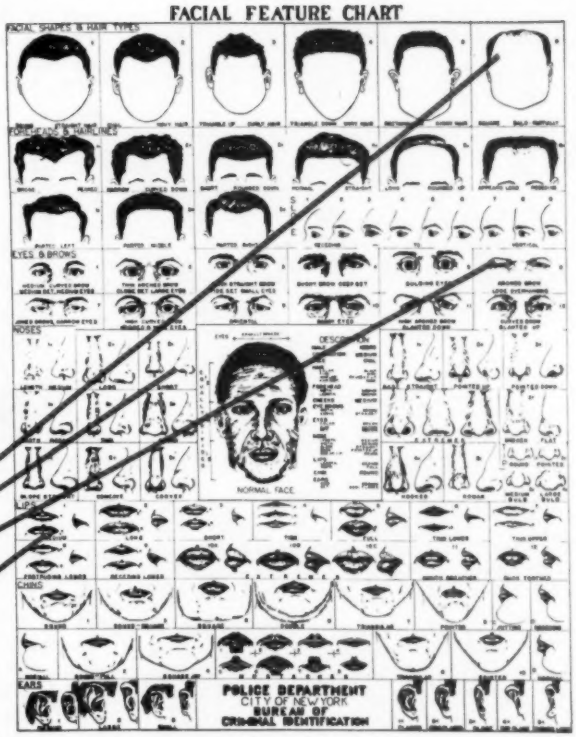
New techniques. The nonprofessionals tried new tricks. Often they worked alone. They chose busy banking hours and mingled with the crowd at the teller's window. They went unarmed—but would pretend, usually with a note, to have a gun, hand grenade, or a bottle of acid. Sometimes they carried off the loot in an innocent paper bag. The police took to calling them "note passers" or "bag bandits."

In some ways amateurs are a pain in the neck to the police. They're hard to trace and they're jittery—they just *might* throw the acid they *might* be carrying. But police generally figure that the professionals are a worse threat because they're smarter. Novices may start a crime wave, but sooner or later the pros come in to ride the crest.

Flies at the sugar. From the viewpoint of a crook, bank robbery has one big advantage—it pays off in money. "After all," as New York Police Inspector Raymond Maguire puts it, "you're dealing with a useful commodity. The hijackers or warehouse robbers get maybe 33-percent profit when they sell the stuff. Take a bank and you clear 100 percent."

In the opinion of some law-enforce-

"What'd he look like?" the police ask. Here's how they help you to remember



IF YOU'VE SEEN A CRIME, chances are you won't recall all the little details. But you know more than you think. To aid your unconscious memory, police use charts like this. Then they build a composite drawing of the suspect. Here a POPULAR SCIENCE artist shows how it might have been done for Frank Sprenz, now serving a long term for bank robbery in Ohio.

ment experts, this is only part of the story behind the rise in holdups. Neither the amateur nor the pro would have turned to banks, it's argued, if the banks hadn't developed into such pushovers.

The big pitch in bank design after the war has been for them to drop their fortress look and become "friendly." The purpose: to make the depositor feel wanted. And that's the trouble, many authorities complain: They're *too* friendly. One hard-bitten expert draws a parallel with the preacher's comment on low-cut dresses: "They're an invitation to sin."

Other trends were at work, too. Banks branched widely, spread out to the suburbs and became drive-ins. Tellers were brought out from behind cages and put behind plain counters. Word got around that banks were insured and no teller need risk saying "no" to a gunman.

To war against both kinds of thieves—the shrewd old hands who've been known to time holdups to coincide with street-clogging factory-shift changes, as well as the wild-eyed novice note passers—bank-security authorities are recommending some specific robbery preventives. Among those that can be described are these:

An effective silent alarm. Old-fashioned alarm systems clanged in and outside the bank. This was dangerous; it brought more people to the scene, and often started the lead flying. Nowadays banks are increasing wired with silent alarm systems like those operated by American District Telegraph or Holmes Protection Service. When tripped, the alarm rings in the protection-company office and is then relayed to the police. In small towns there may be a direct hookup with the police station. And in

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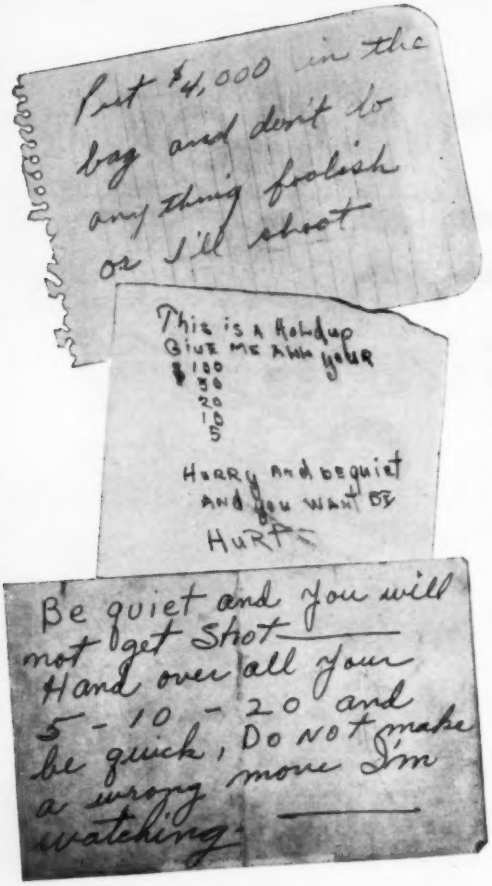


THESE ARE TYPICAL NOTES recovered by the F.B.I. The $4,000 man was carrying a toy pistol. Other weapons used range from sawed-off shotguns to baseball bats, acid, hand grenades.

some Midwestern towns the system is rigged to ring in the homes or offices of private citizens. These "vigilantes" hop into their cars, fan out around town, and set up road blocks.

Time locks and relocking devices. When they first came into use, time locks were tough hurdles for the old-time safecrackers. They were set so that the vault could only be opened at fixed times of day. Newer forms are trickier. If robbers succeed in timing their operations to coincide, a relocking mechanism may be tripped that again seals the vault doors.

The hidden camera. A concealed movie camera may be fitted to film the robbery. Mosler Safe Company has one called the Photoguard, developed after a rash of bank robberies in Cleveland. (During one stretch in 1956, there was an average of two jobs a week there.)

On April 12, 1957, a Photoguard was planted in the St. Clair Savings and Loan Association—an institution victimized so often that the cops were calling it "robbery-prone."

The following day, the bank was held up by a man with a gun and a girl accomplice who scooped the money into a paper bag. A clerk tripped the camera. Within an hour police were studying the developed film. Still shots were sent out to newspapers, and prints of the movie were distributed to TV stations.

The result: The robbers were rounded up within 36 hours. Police traced the man through odd body movements. He turned out to be an epileptic who liked to dance—well known at local dance halls. The girl, too, was traced in part by posture—one reason why authorities say disguises won't fool a camera.

The deterrent effect of this well-publicized capture was fantastic: Cleveland had no more bank robberies for the next 15 months.

But alarms and cameras can function only if they're actuated. The tripping devices themselves have to be made less obvious. Two of the latest are:

- A foot rail: The teller slips his toes under a small ledge and kicks up.
- Electrical relays: Little circuit openers or closers are ingeniously placed so that the teller, though seeming to comply with the robber's demands, actually triggers the alarm or camera.

Wider placement of such gadgets is being tried: in washrooms, executive offices and near telephones.

Teller training. New emphasis has been laid on employee education. Basic holdup precepts call for clear thinking, careful noting of details, and doing no more than the criminal asks. In a tally of New York's 1958 bank robberies, a startling number of tellers gave a robber more money than he'd asked for. Some tellers even returned the note!

Police now are asking each witness to write his description of the crime as soon as he can—before comparing notes with others. Composite feature charts are used to aid a witness in describing the thieves, and then an artist draws the re-

[*Continued on page 270*]

TWO-MAN LADDER. Here's a ladder that permits two-way traffic: One man can go up while another comes down. It was designed by a California contractor to speed construction. The center vertical piece increases the ladder's stability.

TRENCH DIGGER. This ditching machine scoops a two-foot trench four feet deep (just above) at 12 feet a minute, digs a foxhole (top) in less than two minutes, a machine-gun emplacement in five. It was developed by Army engineers at Fort Belvoir, Va., for air drop to troops on a battlefield.

6,000 SHELLS. Held in the wastepaper basket at right, they represent one minute of firing by a six-barreled Vulcan cannon. The Vulcan is shown at far right under the nose of the Republic F-105 Thunderchief it arms.

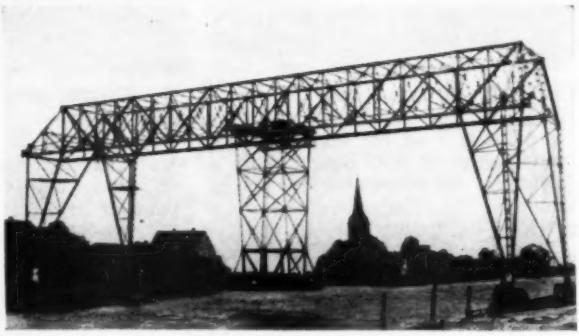
The 20-mm. gun throws a ton of lead a minute, to make the 1,300-m.p.h. fighter-bomber the world's most powerful one-man plane.

GROUND SKIS. With skiing equipment like this, you don't even need snow. All that's required for year-round practice of jump turns (far left), slaloms and schussing is a smooth sloping lawn.

Basically the device resembles ordinary skis, but with rubber-rimmed wheels at front and back. Experts who have used these Land Skis say that action is almost the same as that in snow skiing. It is helped by tiny rubber grommets (arrow) at the end of the fork. These allow the rear wheel to swivel five degrees to right and left.

DRY-FOOT FERRY. The odd structure at right resembles a bridge on which someone forgot to add the approaches. It is a German ferry spanning the Oste River to connect Basbeck and Osten.

Cars and trucks are taken on the ferry platform from docks at either end, transported across the river by motor-driven wheels on overhead rails.



SHEEP COATS. The flock of sheep at left is all dressed up in plastic overcoats. They are used in an experiment by the University of Wyoming to make wool more valuable, by protecting it from dirt.

The white coat in the photo has a cotton-fabric base, the black ones a nylon base, gray ones burlap.

What Causes Those Awful Turnpike Tie-Ups?

Sometimes—for no good reason—cars bunch up, slow to a crawl, then it's bumper to bumper. But smart drivers can help

By Eliot Tozer

WHEN you're slowed to a maddening crawl on a 60-m.p.h. turnpike, you know the frustrated feeling the traffic engineers of the New York State Thruway Authority have when they look out on Sunday afternoon and see cars standing still on their new, six-lane highway. They've seen traffic on their super expressway back up as much as three miles—even when skies are bright and there are no disabled cars to clog the lanes.

Obviously something is wrong. Each 12-foot lane of New York's spanking new Thruway is designed to carry 1,500 cars per hour at 60 m.p.h. At least 4,500 cars

CONTINUED

"Like an accordion, traffic squeezes up, then spreads out"

per hour should be able to sluice through the toll gate at Spring Valley and then roar south to the huge Tappan Zee Bridge on the Hudson at 50-60 m.p.h.

Yet, on occasion, the cars creep, taillight to headlight, or stand still. Not for this did Detroit design 250-hp. cars.

Why the delays? Even, sometimes, when traffic is light?

The answers that Warren Wells, Thruway Director of Operations, and State Police Capt. Robert Annett came up with—after weeks of study in helicopters, planes and cars—are surprising.

They show that Thruway drivers themselves cause the snarls.

To find out how, Wells and I climbed into his Olds 98 one day and cruised south from his Albany headquarters.

It was 4:00 p.m. on a hot August Sunday when we came to the Route 303 interchange in West Nyack, N.Y. He had hung his special Motorola VHF radio receiver on the front-seat window and was standing outside the Olds watching the surge of cars. He was hearing transmissions from troopers and traffic engineers all along the New York (southern) section of the highway, and from the Communications Center in Albany.

"Let's head north," he said. "Harriman interchange just called. The count is up to 3,500 per hour."

He tooled the Olds onto the entrance ramp. On the acceleration strip, or entrance lane that fuses into the right-hand ribbon, he hit 50-plus. When he turned onto the Thruway itself, we were cruising at max allowable, 60 m.p.h.

The slowdowns. "Interchanges like this give us a lot of trouble," he said. "We get what we call 'marginal friction.' Cars enter traffic at low speeds and slow down several of the cars coming up behind them. They ought to get rolling on the acceleration strip and enter the highway at traffic speed.

"Same thing when they turn off. They slow down while they're still on the highway, instead of turning off at high speed and slowing on the deceleration strip."

We climbed a mile-long upgrade and Wells gave her a touch more power. "Hills like this are another troublemaker," he said. "Drivers let their speed drop way down and traffic begins to string out. Then—and we've never been able to figure out why—they take forever accelerating back to normal speed again. Sometimes the slowdown is felt a couple of miles back."

He picked up his mike. "Seven Zero

How You Can Help

In the words of one Thruway trooper, "Drivers make the difference when it comes to keeping traffic flowing." Here are his rules-of-thumb:

- Accelerate quickly when you leave a toll gate.
- Don't slow down to rubberneck.
- Add power to maintain speed on long upgrades.
- Accelerate to traffic speed before you swing onto the highway.
- Decelerate on the deceleration strip —*after* you leave the highway.

In addition, try to make use of all lanes, especially at a toll gate. And, when traffic is heavy, drive in the right-hand or center lane. Chances are that traffic here is moving as fast as traffic in the speed lane.

ONE REASON FOR JAM-UPS: Approaching a toll gate, drivers tend to crowd into the three or four center lanes. Then, to make matters worse, they are often too slow in pulling away.

One from Car Six. I'll be at Spring Valley in five minutes."

He put the mike on the seat beside him. "The 'Seven' numbers are troopers," he said. "That's Lt. Barber. He can take you up to Harriman for a look-see."

Lt. Richard Barber, commander of the State Police on the Thruway section, was trim and tanned, with close-cut gray hair. "Traffic is picking up fast," he told Wells.

"When you get back, we'll watch it from the Palisades Interstate Parkway Bridge," Wells said. "It may get really rough later, if those clouds open up."

Barber and I walked toward his Ford. "What do you think causes the bottlenecks, Lieutenant?" I asked.

Waiting at the gates. He pointed to the toll gates. "There's one of the causes," he said. "Some drivers just won't use all the lanes available. They have 12 open southbound lanes to use right now, but they're using only 10 of them. And they mostly use the three or four center ones."

I looked. Ten or 12 cars were waiting at the toll gate in each of the three center lanes. In most of the others there were only a couple of cars.

Barber smiled. "Same thing holds true out on the highway," he said.

"The outside lane is used only 65 percent of the time and the center lane only 85 percent. We found that out in helicopter counts. If drivers would use all three lanes, especially when we're running peak traffic, we'd have fewer jam-ups, maybe none."

"Wait a minute," I said. "Trucks and buses have to use the right lane. The Thruway speed limit for them is only 50 m.p.h. Do you expect cars to drive behind buses and trucks?"

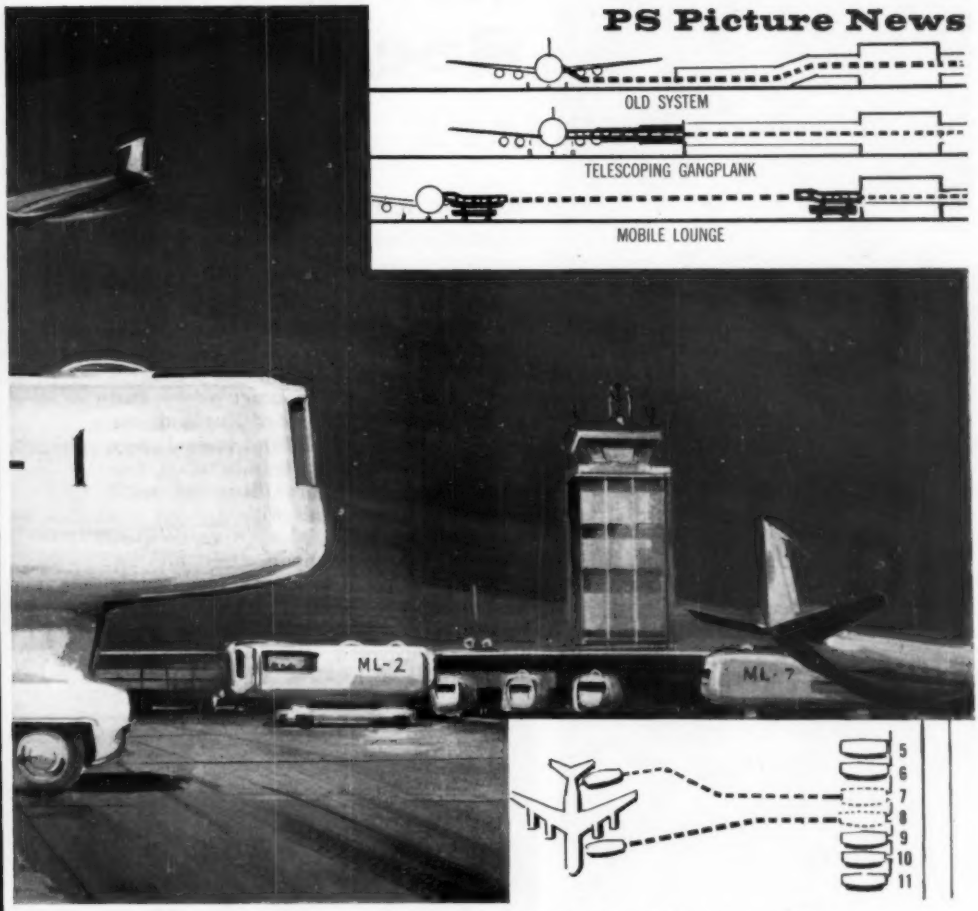
"When we're running heavy, everything's going at the same speed," he said,

[*Continued on page 252*]

INTERCHANGES MAKE TROUBLE, TOO. Cars enter the traffic stream at low speeds, holding up cars behind them. They ought to get rolling close to the maximum while on the acceleration strip.

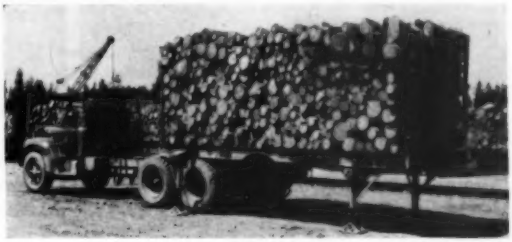
AIRPORT FERRY. Jets often load and discharge passengers far from their terminals. So the Federal Aviation Agency has adopted a radical idea for the all-jet Dulles International Airport to be opened at Chantilly, Va., in 1961. Long hikes in open or telescoping gangplanks (inset upper right) will be unnecessary. Instead, passengers will ride in 15-by-60-

IRELAND'S FIRST. This fiberglass four-passenger sports car, appropriately called the Shamrock, is the first built in Eire. It's assembled at Tralee, County Kerry. Parts, made in England, include an Austin A55 four-cylinder engine that does 90 m.p.h., gets 37 miles to a gallon. The hardtop is removable.



foot plane-level mobile lounges on wheeled stilts, driven from either end. Where jets load fore and aft, two will be provided (lower right), one for passengers to be seated up front and one for those in the rear. Passengers will enter at designated gates, take seats and be wheeled away in comfort to waiting planes.

LUMBER LOADER. Special trucks with detachable bodies having built-in jacks are used by the Bangor and Aroostook Railroad to load lumber at a new 22-car siding in the Maine woods. The trucks bring in loads, lower the jacks, pull out from under and drive off for more, leaving their loads for transfer to trains.



Now it can be told:

Secrets of

Britain now reveals how her experts fought a deadly battle of wits with German technicians

By Harry Walton

A BOMB that doesn't go off is as cruel a challenge to courage as one that does. In the blitz of England, one in every 10 that fell did not immediately explode. Homes had to be evacuated, factories idled, transport disrupted until such bombs were dealt with.

Some were duds. More were deliberately rigged to explode after an unguessable delay. Clockwork fuses made working on any bomb a ghastly gamble. Hair-trigger switches blew bombs up as diggers uncovered them. Others lay doggo until a luckless disposal officer

In one violent raid, a bomb buried itself 12 feet deep in London's Manor Park. Digging, disposers found a dreaded hookup: clockwork and trembler fuses.

No ticking was heard through a stethoscope. But knowing the danger, Captain M. F. Blaney attached an electromagnetic clock stopper.

the War Against Time Bombs

undertook to withdraw the deadly fuse.

Cloaked in strict secrecy—for knowledge of successes and failures would have been priceless to the Germans—British experts in World War II fought a battle of wits, mechanical ingenuity, and raw courage with Nazi armorers. Only now, almost 20 years later, can some of the maneuvers in this deadly game be revealed. The story is chillingly told in a recent book by Major A. B. Hartley of the Royal Engineers.*

Though prepared for raids, the British were not equipped at first to deal with the aftermath of time-delayed bombs. The first hint of this came with the removal of an unfamiliar German fuse on August 13, 1940. Ticking ominously, it was gingerly disassembled by experts. They removed the detonator but let the clock run. It released its striker 38¾ hours after the bomb fell.

Clockwork was treacherous. It might be set to run any time from two to 80 hours. Worse, it was unreliable. "Bomb disposers learned from bitter experience that the clockwork had a habit of stopping," writes Major Hartley. "But a slight jog might restart it, and almost invariably it would turn out to have stopped a very short time before it was due to initiate the explosion."

What were they like, the men who came to hand grips with ticking death? In that grim year of 1940 the average life expectancy of a disposal officer was 10 weeks. A candidate for the Bomb Disposal Service, its members would say, had to be "careful, strong, single, fleet of foot—and prepared for the afterlife."

*Unexploded Bomb, *by Major A. B. Hartley; published by W. W. Norton & Company, New York.*

Thinking the condensers in the fuse dead, he planned to remove the bomb and later steam out the TNT. But first he had to take off the stopper.

Pulled out, the bomb dangled above ground. As Blaney put a hand out to steady it, it blew up. Condensers later proved to hold a charge 60 days.

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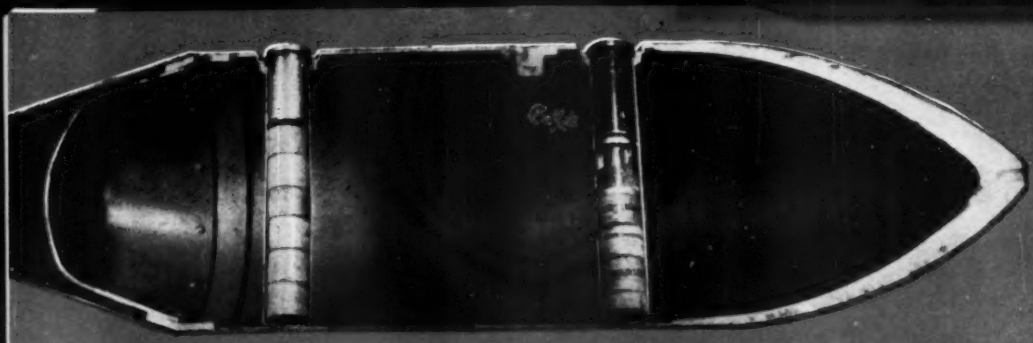
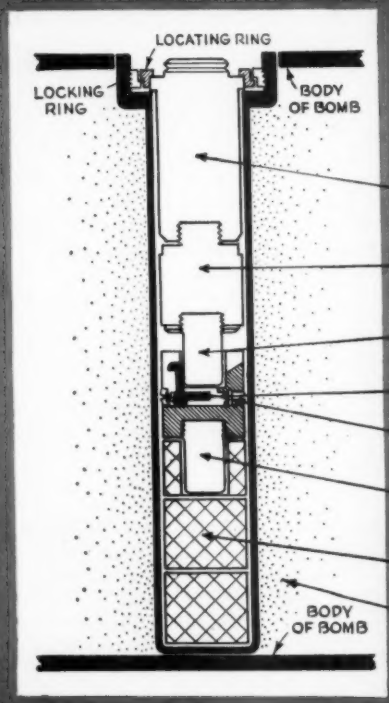




What triggered the Nazi bombs

1. Electric fuse with trembler switch starts clockwork after impact.
2. Clockwork runs for time it was set by the bomb armorer.
3. Clockwork striker fires "gaine," a sensitive penthrite charge.
4. Spring trigger of anti-handling trap is held back by gaine.
5. If clockwork is lifted out, gaine releases trigger, firing cap.
6. Cap of anti-handling trap fires its own gaine or initiating charge.
7. Explosion of either gaine sets off picric-pellet booster charge.
8. Explosion of powerful booster charge detonates main filling.

Nerves raced electricity in disarming the bombs. The Germans used electric fuses, powered by condensers charged at the instant the bomb fell from the plane. When the charging head pulled away from the two spring plungers on the fuse boss, the plungers snapped back, breaking contact with the live circuits.

Discharging the condensers was the obvious way to disarm such fuses. But pressing down the plungers might actuate sensitive trembler switches. One early tool for the job had a hydraulically operated pin for each plunger, connected to a 450-foot oil-filled hose. The disposer pushed the plungers from a distance.

Clockwork made this method obsolete. The clock was merely started by the electric fuse; thereafter it ran its fatal course unaided. The only way to stop the clockwork for good was to yank it out.

Only a bomb disposer knew what it took to hammer loose a locking ring and draw out the mechanism. Dropping a tool might mean the few seconds delay that made the difference between life and death.

The Germans next gimmicked the clockwork fuse. Late in August, 1940, a Lieutenant Archer, amid the flames of

SCATTERED BY THE DOZEN, tiny 4½-pound butterfly bombs hung on wires, hid under hedges, lay on rooftops. Vanes snapping open in midair rotated the rod, arming the fuse.

PRIMED FOR DEATH, butterfly bombs like those above could not be disarmed, but only detonated. Fuses were so sensitive that an exploding bomb set off others nearby in a chain reaction. This made every hidden bomb a booby trap. Some, painted yellow, attracted children.

exploding oil tanks, ripped out a loose fuse pocket. Removing the clockwork, he unscrewed the deadly little "gaine," or initiating charge, from it. Then he saw something else inside, with a second gaine. An instant after he unscrewed this—a miniature bomb itself—the cap flashed.

He had removed a ZUS 40, an anti-handling trap with a spring-loaded pin that should have blasted the bomb when he withdrew the clockwork. A mechanical defect had saved him.

Cooking out high explosive was one answer to such booby traps. A remote-controlled, steam-powered drill cut a hole in the bomb and then injected live steam. The emulsified TNT ran out.

But not always. One disposer steamed out a bomb, and called two other men to remove the supposedly empty casing. The bomb went up, killing all three. Only half the filling had been removed.

A training-center sergeant, emptying a modest 110-pounder, tried hot water instead of steam. Pouring it on, he puddled and spooned out the explosive with a stick. At noon he went off to lunch.

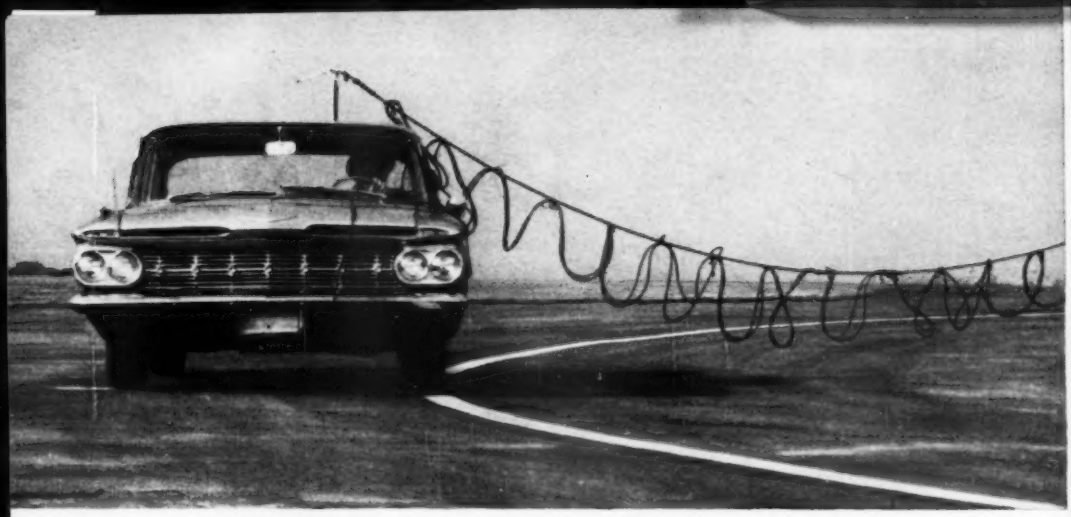
TNT resents being softened and rehardened. Soon after the sergeant returned to the task, the mess went up.

In September, 1940, the Germans sent over a new fuse with wire-sprung switches so delicate that in one test they reacted to a pencil tap on the bomb case. Worse still, the condensers could hold a charge two months.

Teamed with clockwork, this super-sensitive fuse posed an almost insoluble problem. A magnetic clock stopper would indeed stop the clock—but its field would

[*Continued on page 256*]

AN EARLY FUSE EXTRACTOR known as Freddy was clamped on the bomb, its head gripping the fuse boss. The disposer then pierced a soda-water (carbon dioxide) cartridge. He had two minutes to seek cover before the gas-powered rig began pulling out the unpredictable fuse.



FROM THE LABS:

Cars That Never Need a Grease Job

Out go the grease fittings as new plastics, rubber, sealed bearings smooth your ride

GREASE guns and lube racks are doomed. New cars will never need a grease job. They will be lubricated for life at the factory. Several no-lube makes are already being built in Europe, and the first U. S. model may roll off the line this fall.

Ford engineers have been thinking about scrapping all grease fittings from 1960 Thunderbirds—they would have done the same with their new little Falcons if they'd had more time for testing.

But even if Ford decides not to go lubeless for 1960, it will be just a stay of execution for grease fittings. Several makes will eliminate them in 1961, and by '62 or '63 all cars should be lube-free.

All chassis points that have required periodic greasing will be protected against friction by one of three means:

- Bushings and bearings of plastic, including new plastic fibers.
- Shackles and bushings of rubber.
- Sealed reservoirs containing improved lubricants.

You'll no longer have to take the old bus on its periodic pilgrimage to the lube rack at the corner station. And you'll save close to $20 a year.

The lubeless car climaxes a trend that started 10 years ago. In 1950, new models carried, on the average, 24.3 fittings to be greased. By 1958 the average had dropped to 10.7 lube points.

There are three major reasons for this eight-year decline of nearly 60 percent—and for engineers' efforts to get rid of the fittings that still remain.

- Many car owners don't bother to lubricate regularly.
- The lubricants don't always do the job they're supposed to do.
- Lube service is often slipshod.

Result is that parts wear more rapidly than they should and owners don't get the steering ease and riding comfort that are built into their cars.

People-proof cars. First big step in solving these problems—making cars "people-proof," is the way they put it in Detroit—was development of ball-joint front suspensions. This permitted drastic reductions in the number of grease fittings needed. Lincoln dropped from 28 lube points in 1951 to just 13 in 1952,

SMOOTHER RIDE of new greaseless bearings was demonstrated by test car (left), which compared them with standard type in ball-joint suspension and steering linkage. Cables carried performance data to recorders in monitor car at right.

PLASTIC CLOTH is key to lubeless car. It eliminates need for grease in ball-joint suspension (above). Cloth, woven from extremely slippery Teflon fibers, is formed into cup and bonded inside bearing socket. Metal ball slides smoothly and easily on cloth, which is better than grease: more even, more dependable—and permanent.

when ball joints were introduced. Chevrolet went from 25 fittings to 10 when it changed over to ball joints.

Increased use of rubber bushings and eye shackles as insulators between metal-to-metal contact points has helped, too. More recently, improvements in sealing materials have made it possible to add a lifetime supply of lubricant to some parts right on the assembly line, then button them up and forget about them.

Plastics have played an important part in eliminating grease fittings—and their role will be even bigger.

The key plastic is Teflon, the fluorocarbon developed by Dupont. Telflon is

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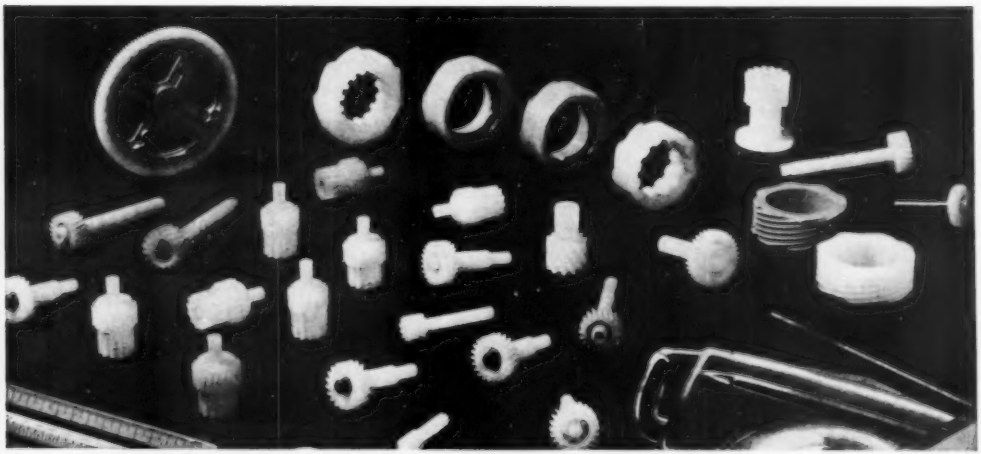
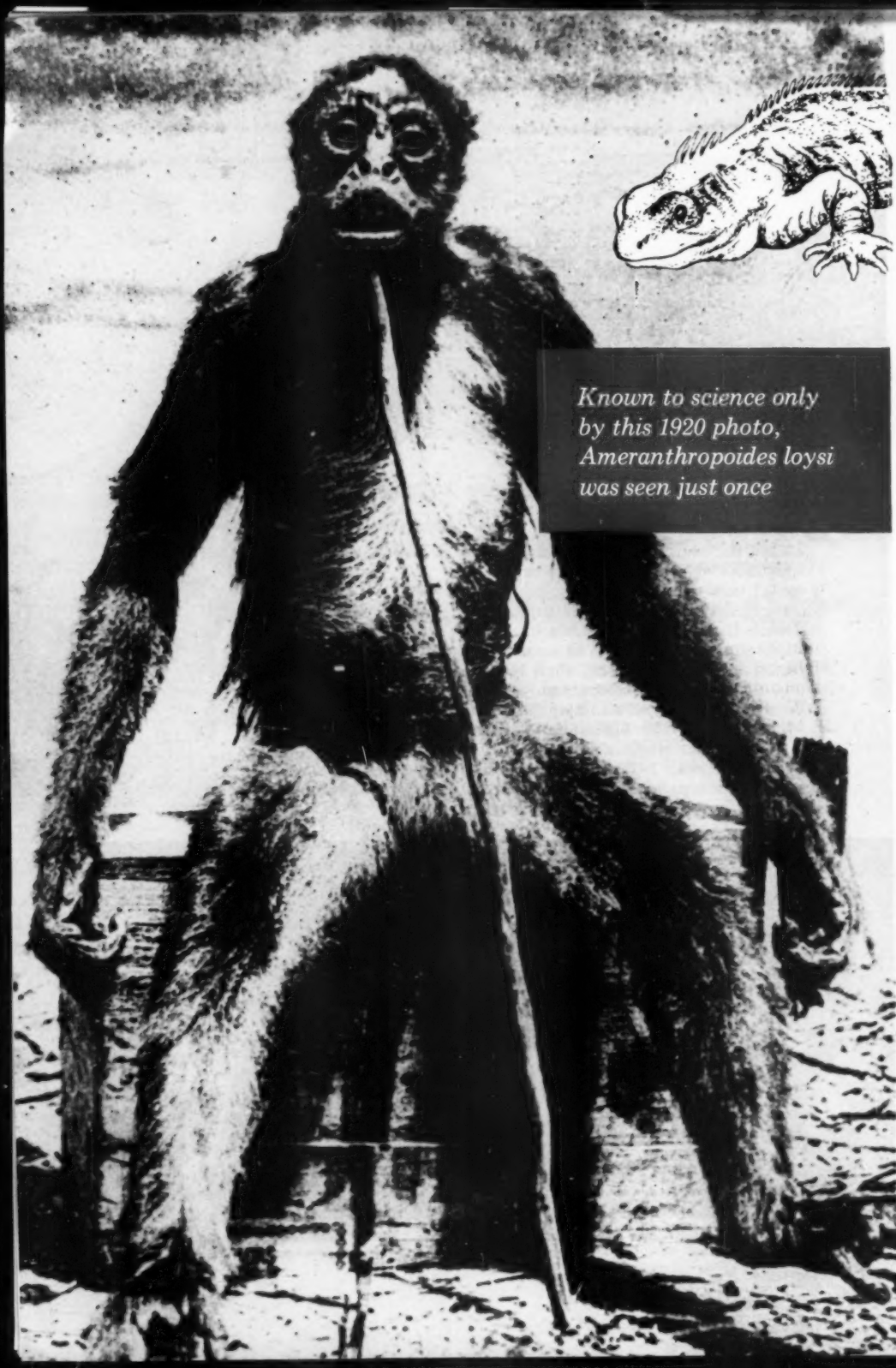
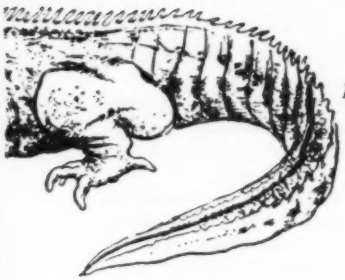


PLASTIC PARTS—these are Zytel nylon—eliminate small lubrication jobs. No-lube car also uses rubber shackles, permanently sealed-in-oil bearings to replace joints once greased.



Known to science only by this 1920 photo, Ameranthropoides loysi was seen just once



A legend that turned into an ugly fact: the Komodo Dragon.

Deep in the "taiga" the hairy mammoth may still trumpet its defiant call.

DO "EXTINCT" ANIMALS STILL SURVIVE?

A closer look into the world's unexplored jungles and wastelands may reveal some strange creatures, says a noted biologist

By Everett H. Ortner

The orang pendek is said to speak an unintelligible language.

DOES the hairy mammoth, ancient cousin of the elephant, still nip mosses in some frozen Siberian fastness that man has not yet explored? Does the giant moa, a flightless bird that stood 12 feet high, still lay its eggs, big enough to make omelets for 70 people, deep in the New Zealand forests? Is the Impossible Waitoreke possible?

These things may well be, says one eminent zoologist, who considers that reports of the demise of many beasts that roamed the world eons ago are greatly exaggerated, and that still others, whose rumored existence is scoffed at by scientists, are nonetheless alive and waiting to be discovered and stuffed. The expert: Dr. Bernard Heuvelmans, a Belgian whose book setting forth these and other claims has just been translated into English under the title, *On the Track of Unknown Animals* (Hill and Wang, Inc., New York; $6.95).

Consider the Komodo Dragon, says Dr. Heuvelmans. Back in 1912, an airman who made a forced landing on the Malay island of Komodo reported that he had seen fierce dragons there that ate—according to the natives—pigs, goats and deer, and even attacked horses. Zoologists ignored the report when it appeared that the unlucky flier had no university degrees in zoology.

But soon afterward, the Dutch civil administrator obtained the skin of an enormous lizard that matched the "dragon's" description. And shortly after *that,* several more—evil-eyed, 12-foot monsters—were captured alive,

The pterodactyl: Was it this flying flesh-eater that attacked one explorer?

CONTINUED

If the Impossible Waitoreke is possible, many textbooks

Mummified remains of the moa have been found. But no one knows whether this 12-foot bird still exists.

turning the legend of the Komodo Dragon into an undeniable scientific fact.

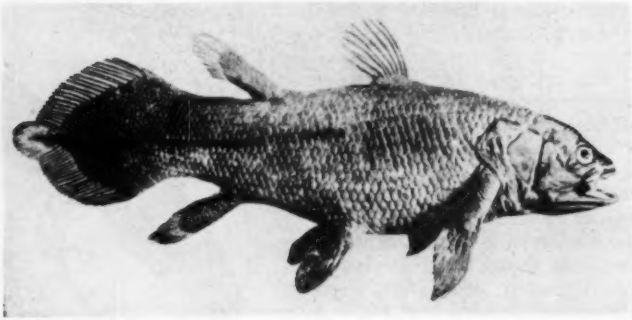
Or take the case of the coelacanth, a forbidding fossil fish whose obituary, written by paleontologists, had put its time of death at some 70,000,000 years ago. In 1938, one swam, seemingly out of the Mesozoic era, into a South African fisherman's dragnet. Since 1952, flicking fresh salt spray on the scientists' wounds, a number have been captured alive.

Sorting the new ones. What are the chances of an animal's being unknown to science? Less than in the past, but still excellent, according to Dr. Heuvelmans. His reasoning: Two centuries ago, when animals first began to be classified systematically, only 808 amphibians, reptiles, mammals and birds were known. By the beginning of the present century, the number had increased to more than 21,000. By 1960, Dr. Heuvelmans estimates, 60,000 creatures will have been described and named. Since the beginning of the century, he says, approximately 15 previously unknown reptiles or amphibians, 220 mammals and 400 birds have been described each year.

"This does not mean that they were all really new," he adds. "Many zoologists create new species and subspecies on the strength of barely perceptible differences. All the same, we can reckon that one in 10 of these descriptions refers to a clearly distinct species. Therefore each year the catalogue includes some 40 birds and 20 mammals that were hitherto unknown." Most of these are small songbirds, little rodents or bats, or even small marsupials or insect eaters. "Reptiles and amphibians are much rarer and almost an exception," he says. "There are no more than one or two a year."

Probing the far corners. Where are these unknown creatures to be found? All over, says Dr. Heuvelmans, but especially in those areas of the world that are little known or even unexplored. Excluding Antarctica, these make up a *tenth* of the world's surface. The central and northern parts of Greenland, for example, have never been trod by a white man. Much of Africa is known only by aerial photographs. In Asia, there are the Himalayas and much of Siberia, China, Burma, India. The Arabian desert of Dahana is, according to one geographer, "the least explored in the world—infinitely less well-known than the poles."

"Nothing whatever is known about the mountainous center of New Guinea," says Dr. Heuvelmans, "except that various tribes, many of them pygmies, still live there in the Stone Age. In 1938 the American naturalist Richard Archbold



A survival from the Mesozoic era of 70,000,000 years ago, the coelacanth had long been written off by scientists as extinct. But in 1938 one was caught in South Africa, and since then many more of the fossil fish have swum into scientists' hands.

accidentally discovered in the western part of the island an excellently irrigated valley inhabited by 60,000 people. And in June, 1954, patrol aircraft found quite unknown tribes in valleys in the southwest. Their population was estimated at 100,000, a third of the number of Papuans already known."

Australia? Most of the interior is covered with deserts of sand, salt and thorny bush. "Hardly anybody goes there," says Dr. Heuvelmans, "except a few prospectors, who come back with tales of animals so fantastic that they are usually thought to be drunken visions." There are even whole mountain ranges that have never been seen except from airplanes.

But the continent that holds the most mysteries is surely South America, with its steaming, tropical jungles—2,000,000 square miles for the Amazon basin alone. Where the Orinoco River rises, in one corner of Venezuela, are vast limestone plateaus—mesas—3,000 to 10,000 feet above the surrounding jungle. Some of these are almost 20 miles long, great islands of thick vegetation about which almost nothing is known. On one of these is a waterfall 15 times as high as Niagara. It was discovered only 20 years ago.

The dragon-bird. Strange legends hang over all these unexplored areas. One traveler in Africa, Frank H. Melland, heard from the natives of Northern Rhodesia of a fierce creature that lived in the nearby Jiundu swamp—like a bird, but not exactly a bird; more like a lizard with wings of skin like a bat's.

Melland noted this down, but only later did he realize its hair-raising implications. Then he renewed his questioning. The beast's wing span, they said, was between four and seven feet; it had no feathers at all; its skin was bare and smooth; its beak was full of teeth.

Melland was staggered. *What he had was a complete description of a pterodactyl*—a giant flesh-eating flying dragon known only to paleontologists, and supposedly extinct for tens of millions of years.

When Melland showed the natives pictures of a reconstruction of a pterodactyl, they nodded and muttered excitedly: *"Kongamato!"*

Other travelers also heard of the

A "living fossil" that carries its age well, the giant tortoise of the Galapagos Islands has remained almost unchanged for 190,000,000 years.

strange flying beast, but only one of them —Ivan T. Sanderson, leader of an expedition into West Africa—ever saw it. Working along a river, he shot a fruit-eating bat, went into the water to recover it. Suddenly his companion shouted: "Look out!"

"And I looked," Sanderson later reported. "Then I let out a shout also and instantly bobbed down under the water, because, coming straight at me only a few feet above the water was a black thing the size of an eagle. I had only a glimpse of its face, yet that was quite sufficient, for its lower jaw hung open and bore a semicircle of pointed white

Could this ugly snout be mistaken in the dark jungle? The mandrill, a fierce African baboon, may be the reality behind native tales of a strange and dangerous bear.

CONTINUED

teeth set about their own width apart from each other."

The living apemen. Across the Sunda Straits from Java, where 65 years ago were dug up the skull fragments that scientists have assigned to a creature they call *pithecanthropus erectus*—apeman who stands up—natives speak of another apeman, believed to exist today. The Dutch settlers call him "orang pendek" (little man) or "orang letjo" (gibbering man).

A small creature, between 2½ and five feet tall, the orang pendek is said to speak an unintelligible language. Reports say that its skin is pinkish brown, and covered all over with short dark hair. It has no tail. It walks on the ground. It is known, says Heuvelmans, all over southern Sumatra below the Equator, and has been described many times.

Perhaps the man to get nearest to one was a Dutchman named van Herwaarden, a curious man who climbed a tree to study, at close range, one of the creatures hiding there.

"The very dark hair on its head fell just below the shoulder blades or even almost to the waist," he reported later. "The brown face was almost hairless, whilst its forehead seemed to be high rather than low. The eyes were frankly moving; they were of the darkest color, very lively, and like human eyes. This specimen was of the female sex and about five feet high.

"There was nothing repulsive or ugly about its face, nor was it at all apelike, although the quick nervous movements of its eyes and mouth were very like those of a monkey in distress. I began to talk in a calm and friendly way, but it did not make much difference. When I raised my gun to the little female I heard a plaintive 'hu-hu,' which was at once answered by similar echoes in the forest."

When the creature, eluding van Herwaarden, slid down the tree and fled, the Dutchman raised his rifle to fire. But: "Many people may think me childish if I say when I saw its flying hair in my sights I did not pull the trigger," he said later. "I suddenly felt that I was going to commit murder."

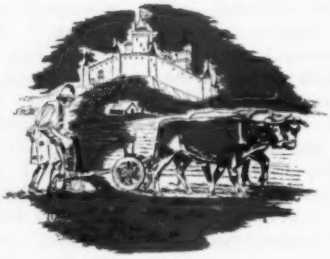
Could an anthropoid—a large, tailless ape with long arms—exist in the Americas? Scientists doubted it, until in 1920 a Swiss geologist, Francois de Loys, brought back evidence from the Sierra de Perijaá, a mountain range that bestrides the Colombian-Venezuelan border. Attacked by two ferocious giant monkeys, five feet tall, de Loys' party killed one, propped it up on a crate, and photographed it (page 84). Scientists are still puzzling over how to classify it.

Mystery in armor plate. Many other shadowy creatures pace through Dr. Heuvelman's bestiary of unknown animals. The neomylodon, a cousin of both the sloth and armadillo, is one. Here there is more to go on than just native rumors. The animals—big as oxen—have left, curiously preserved in an Argentinian cave, skeletons, droppings, even wisps of the hay they fed on. And there are several pieces of hide.

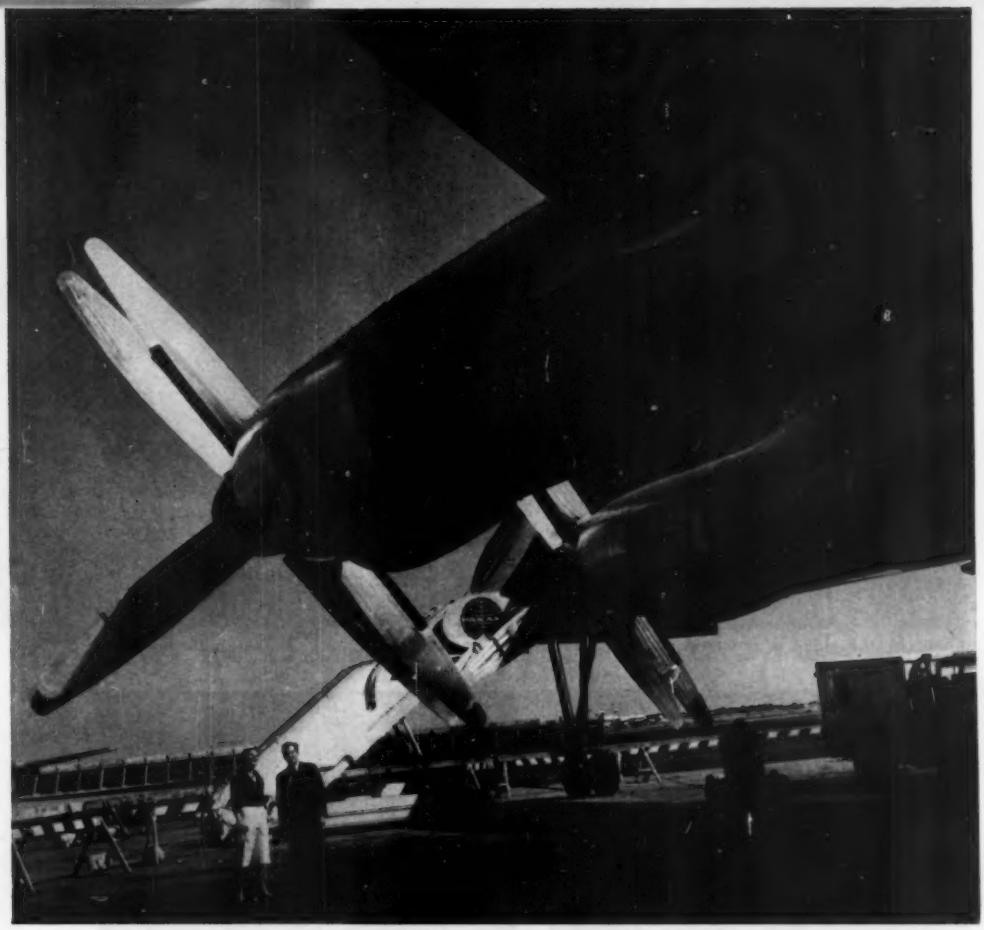
Apparently the neomylodon was on its evolutionary way to developing an armor plate like that of its cousin the armadillo, for it is a strange hide, of thickish leather with bony nodules—like pebbles—embedded in it. And here scientists disagree. Are these bits of hide from an animal that lived recently, or were they mummified by the cave's atmosphere? Members of the London Zoological Society, who examined a piece in 1899, thought it fresh: The leather was supple, there were remains of muscles and ligaments, and a

[*Continued on page 278*]

Where'd it come from?



Acre: How much land could a man plow in a day with a yoke of oxen? That was an acre long before the days of standardization. Henry VIII later fixed it as the area of a strip 40 rods by 4 (implying, of course, a standard rod). Today's acre is still 160 square rods (and our rod is 16½ feet): roughly, a plot 200 feet square.



Russia Shows Off the World's Biggest Airliner

AN AIRLINER with a capacity of 220 passengers—the world's biggest—landed at New York's International Airport recently for display in connection with a science and technical exhibition. The airliner was Russian, a product of Andrei Tupolev, who also designs bombers.

The Tu-114, as it is designated, weighs almost 200 tons, or 75 tons more than the biggest of America's operational airliners. It's so tall that a five-foot ladder had to be put on top of the airport's highest boarding ramp to deplane the passengers. A turboprop, it flew the 4,665 miles from Moscow to New York nonstop in 11 hours and six minutes at an average speed of 420 miles an hour against headwinds.

The Tu-114 will tote 220 passengers only on short, tourist-class hops. It was designed to carry 170 passengers on the trans-Siberian run and 120 in long nonstop service such as that between Moscow and New York.—*Devon Francis.*

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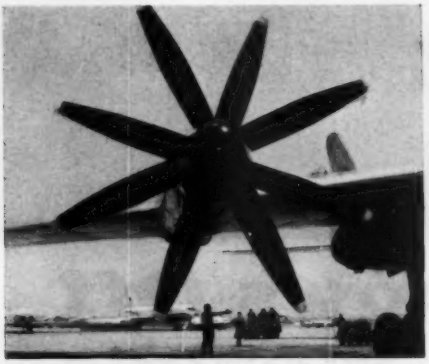
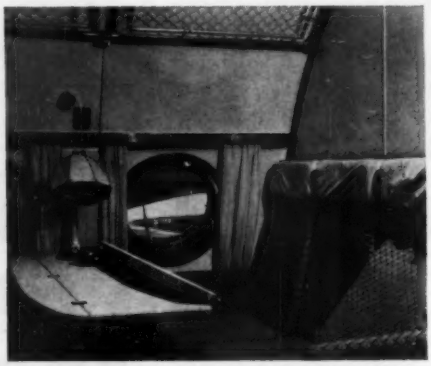
Giant of the skies is powered by four gas-turbine engines developing 12,000 horsepower each.



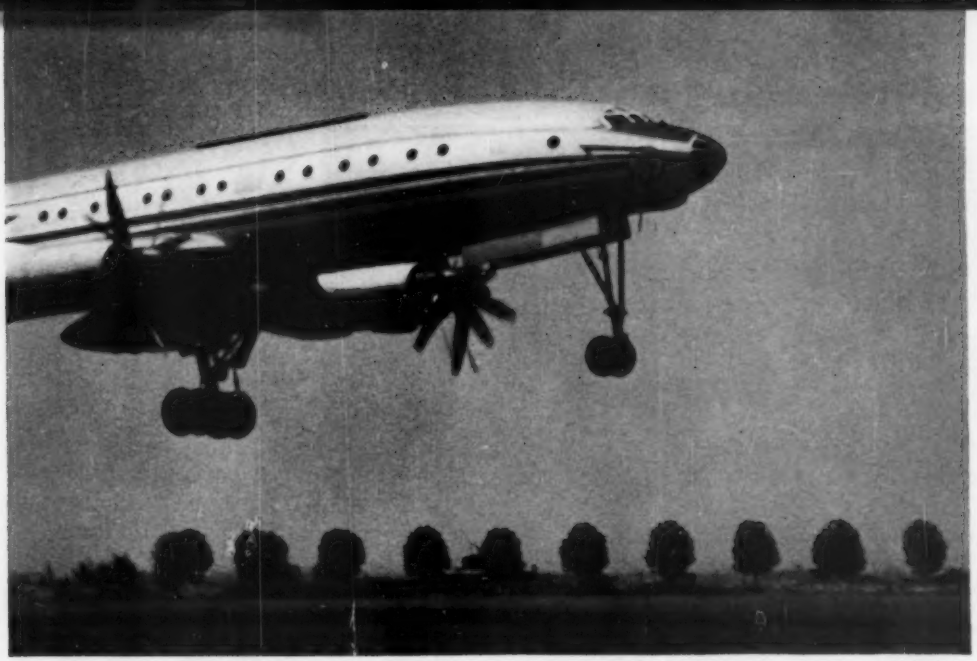
TURBINES DRIVE EIGHT HUGE PROPS, two to each engine, contrarotating. For intercontinental flights, the plane's wing fuel cells can hold 65 tons, or almost 20,000 gallons of kerosene.



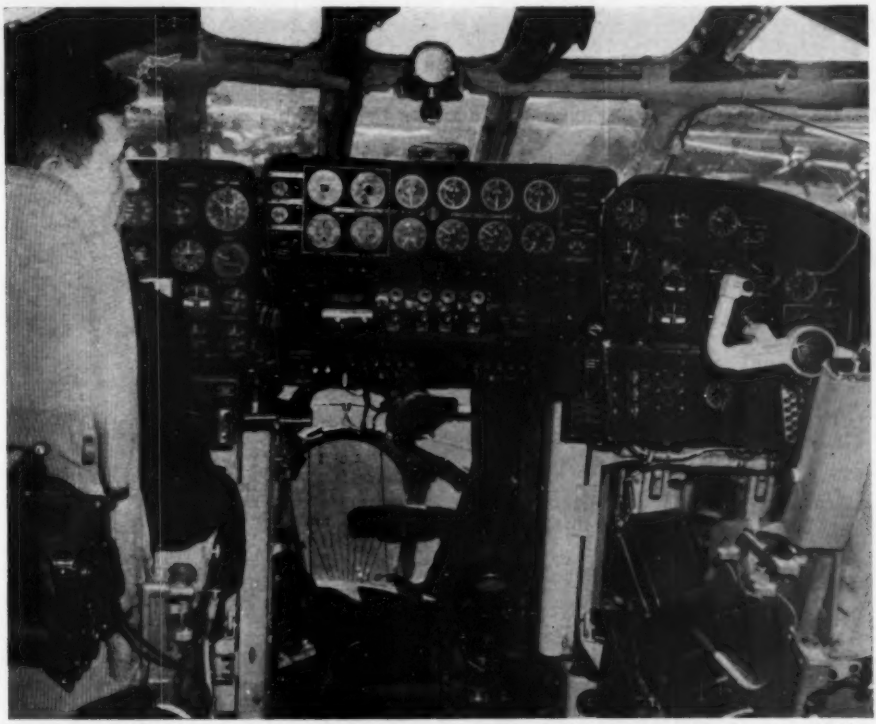
AMIDSHIPS IS THE DINING AREA with yachtlike folding tables accommodating three persons on each side. A lamp sits on one end. Behind the panel are emergency oxygen masks.

COMFORTABLE SEATS, three on each side of wide aisle, are light blue, to give look of luxury. Parcel racks above, of pale gold-colored mesh, fold out of the way against the ceiling.

PRIVATE COMPARTMENTS are the most unusual feature of Tu-114. Like those on European trains, they have curtained doorways, glass panels fronting on corridor. They seat six.

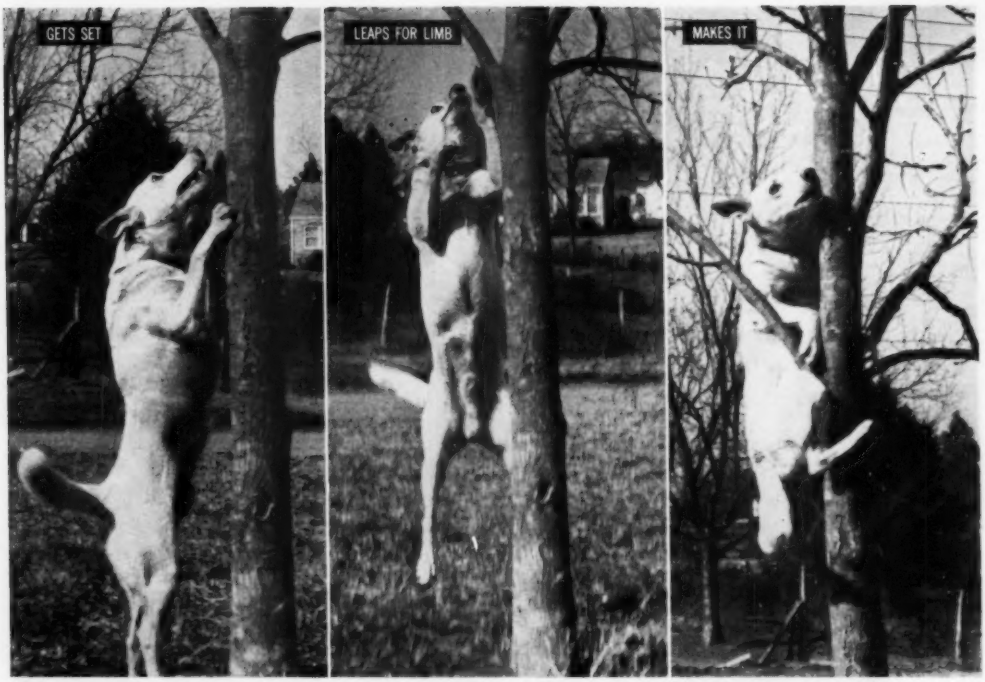


It cruised at 33,000 feet on the way to New York, and carried 30 tons of passengers and freight.

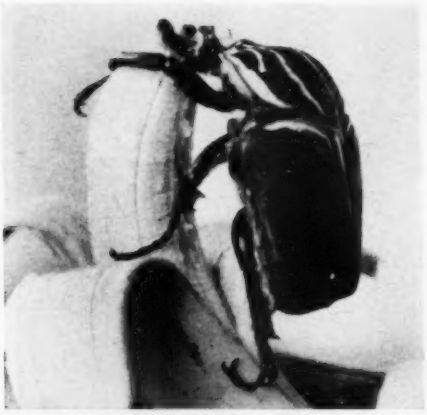


FLIGHT DECK, like those in U. S. airliners, is a maze of instruments and controls. The wing measures 167 feet, tip to tip. Plane is 177 feet long. Its top speed is 540 m.p.h.

Photo above by E. J. Bulban, Aviation Week



BIRD DOG. This determined tree-climbing pooch is the pet of 18-year-old Milton



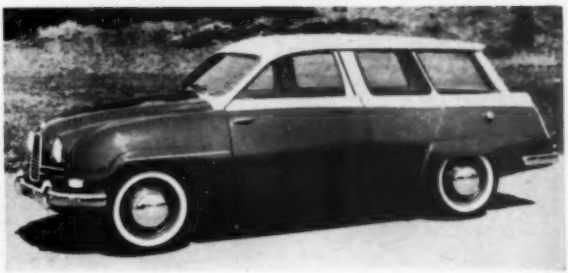
BANANA PEELER. PS fans of Goliathus goliathus [shown lifesize Mar. '59] will be sorry to hear that the world's biggest bug died recently at the American Museum of Natural History in New York. He lived seven months on bananas.

RAIL RIDER. The little single-track "gondola" above is the smallest freight car in the New York City subway system. Maintenance workers push it along the rails for easy transporting of nuts and bolts needed for track repairs.

Alexander of Commerce, Ga. He answers to the name of Tip. His breed's unspecified.

SPORTY SWEDE. Volvo will come out next year with its first sports model. The little car (right) will be exported to the U.S. It will be entirely Swedish except for a body built in England from Volvo designs. The car is 173 inches long, has a 96.5-inch wheelbase, a 51.2-inch tread . . .

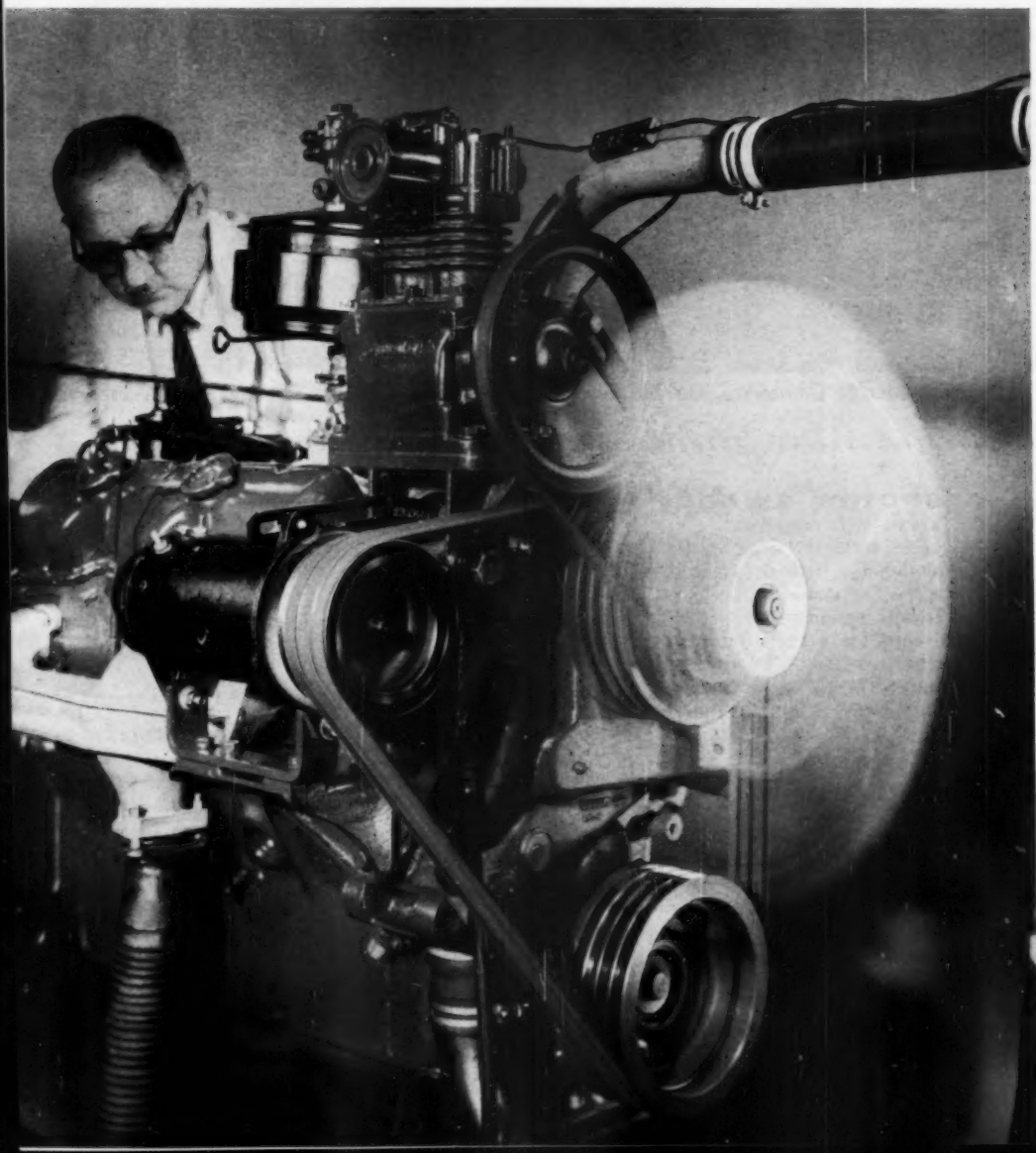
. . . BIG SWEDE. And SAAB is now building a station wagon—pardon, family car. With two back benches folded down, it has floor space, measuring three by five feet, that will hold 660 pounds of cargo. The auxiliary rear seat faces backwards for an unusual view through the rear window.



Detroit's First V-6 Engine

Developing an astonishing amount of torque at low speed, it promises up to 200,000 miles of use without major overhaul

Cylinders in 60-degree bank produce their greatest power at 1,100 fewer r.p.m. than a V-8.



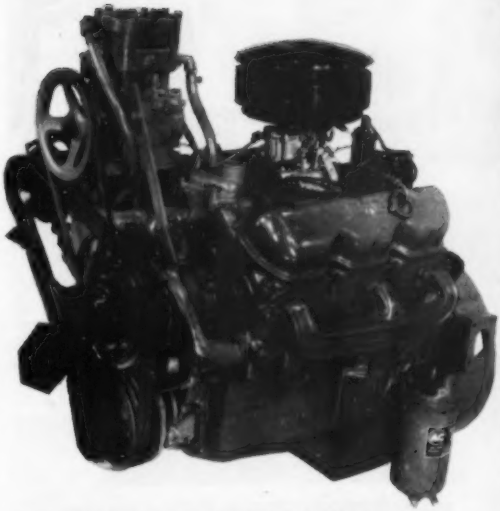
By Ken Fermoyle

"CHECK the water and oil?" I nodded yes and the gas-station attendant raised the hood of a GMC Suburban heavy-duty station wagon. He glanced at the engine, then did a fast double-take.

He counted, ". . . four, five, six," then scratched his head in amazement. "What's this? A V-8 with only six spark plugs!"

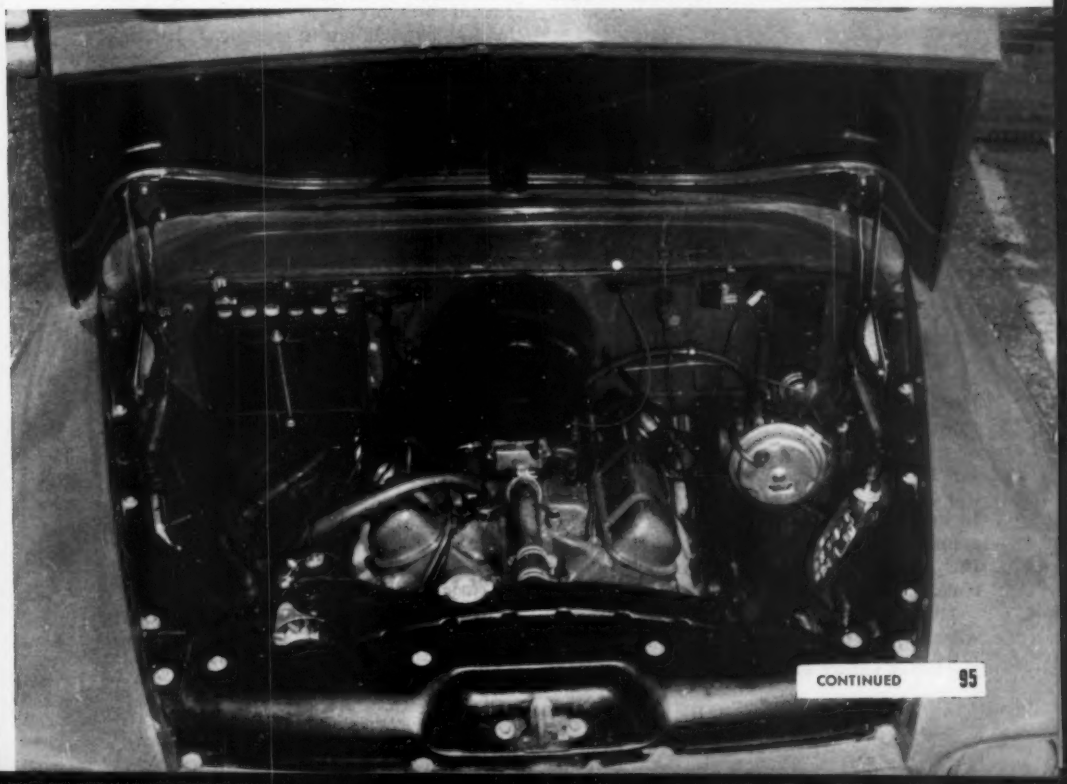
Not quite. Masked in the dowdy wagon was an exciting new V-6, developed by GMC Truck and Coach Division. A 60-degree V-type design, it will come in 6- and 12-cylinder versions. More important, it will mark the first time that Detroit has brought a V-6 out of the experimental labs and offered it to the paying customers. Italy's Lancia has, of course, had a V-6 for years; and it's been an open secret that both GM and Chrysler engineers have been tinkering with these unorthodox power plants.

They're not in production yet—the Suburban that GMC let me have was powered by an experimental job. But you



GETTING AT PLUGS is simplicity itself—because they're on top, between the valve covers. Deep crankcase extends well below the crankshaft centerline. The oil pan is big. Crankshafts have four main bearings and six connecting-rod journals spaced 60 degrees apart.

OIL FILTER is easy to service. Placed at lower left of block, it is full-flow type with bypass valve to permit circulation of oil even if throw-away paper element should become clogged.



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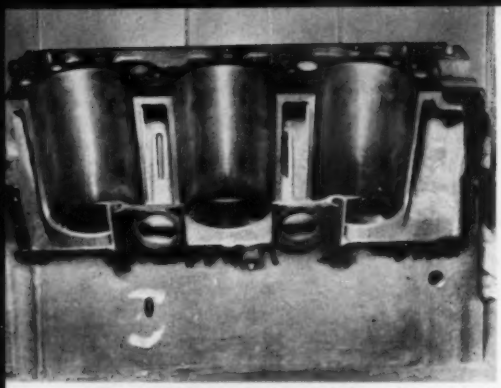
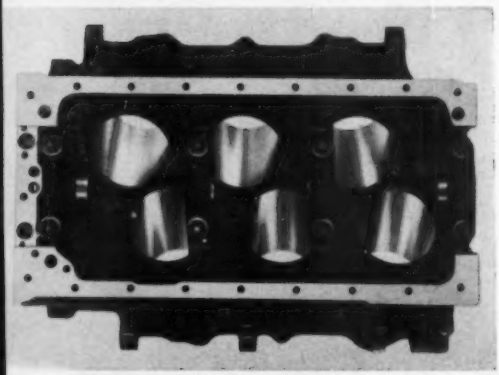


FOR MAXIMUM HEAT DISSIPATION, bores of all V-6s and twin-sixes, shown here in sawed-through cutaway, are completely surrounded by coolant. Pistons are heavy-duty cast aluminum.



BOTTOM VIEW OF V-6 BLOCK shows offset of cylinders that helps make 60-degree banks possible. Narrowness lets it sit between frame rails without interfering with steering.

couldn't be blamed for guessing that they will soon replace the V-8 and in-line six-cylinder gas engines that GMC now uses.

The new engines come in four sizes. Three are V-6s, displacing 305, 351 and 401 cubic inches. The fourth is a whopping 702-cu.-in. V-12—or Twin Six, as it is called at GMC headquarters. Gross horsepower ratings, not official yet, range from 150 at 3,600 r.p.m. for one version of the 305 engine to 275 at 2,400 r.p.m. for the big V-12.

For the truck driver, the muscular torque curves of the new engines promise a lot less work with the shift lever. For the general motorist, they promise less frustration behind crawling trucks.

How do these power plants compare with conventional truck engines? They don't, according to Phil Monaghan, GMC's boss. "Not only do they differ in design, they're far superior to existing engines. They have a potential of between 100,000 and 200,000 miles of continuous operation without major overhaul."

Other advantages include:

- Compact size; shorter than in-line engines, narrower than V-8s.
- Excellent performance; tremendous low-speed torque and plenty of reserve power.
- Superior fuel economy on regular gas, due to low friction and high combustion efficiency.
- High degree of parts interchangeability.
- Easy servicing; parts that need periodic attention are very accessible.

Some of these points showed up quickly in the experimental Suburban that GMC proudly turned over to me.

"Do whatever you like with it," said Monaghan. "But remember that this is strictly a 1959 model except for the engine. It won't give you the full picture of how good vehicles specially tailored for these engines can be."

I was still impressed.

A run through traffic from Pontiac to Detroit was my first experience behind the 150-hp., 350-cu.-in. engine. Although the engine was tight, it jumped the heavy wagon away from lights at a rate that surprised me. The V-6 also pulled very smoothly from low speeds in high gear. I could drop below 15 m.p.h. and still accelerate quickly and easily in high—something that conventional sixes don't do happily.

Next day I checked fuel mileage in rush-hour traffic. I spent several hours driving the type of stop-start pattern the engine would encounter in delivery or pickup truck service. I didn't baby the Suburban. Its acceleration was used freely in getting away from lights and taking advantages of holes in traffic. Then came a stint on expressways, running at legal limits of 55 and 65 m.p.h. In the afternoon it was back to crosstown shift-change traffic of the bumper-to-bumper variety. I expected an average of 11-12 m.p.g. I got 15.5. All this despite a rugged gas-drinking driving schedule, and an engine with less than 800 miles on it.

Easy servicing will be a strong point of these new engines. The gas-station

attendant mentioned earlier, after he recovered from his confusion, agreed.

The spark plugs caught his eye because they're right on top of the engine. "Man, those sure will be easy to change!" said the service-station man enthusiastically—doubtless remembering wrists burned by hot exhaust manifolds on typical V-8s. Cooler operation, because they're well away from exhaust heat, won't hurt plug life, either.

The fuel pump is conveniently located at top right of the engine front cover. Starting motor, oil filler cap and dipstick and generator are on the right. Distributor and coil are mounted at top rear between the cylinder banks.

Valve tappets can be removed through an opening in the cylinder head without removing the head, a real time-saver.

Not so apparent are features that, prolonged dynamometer testing indicates, will give the new engines as much as three to four times the durability of existing engines:

- Blocks and heads are fine-grain nickel-chromium alloy iron. Blocks have deep three-inch skirts for reinforcement.
- All are over-square, have bigger bore than stroke for reduced friction.
- Crankshafts are heavy, rugged. The 401 V-6 shaft, for example, weighs 110 lb. vs. 63 lb. for a comparable V-8 shaft. V-6s have four main bearings; the V-12, seven.
- Lubrication is excellent; rotor-type oil pumps supply more oil at greater pressure than ordinary gear-type pumps.
- Areas of high stress have oversized sections to minimize flexing. Generous fillets and web reinforcements add strength and rigidity to moving parts.
- Careful attenion to engine cooling eliminates wear-producing hot spots.

This last factor is particularly important in producing long-lived engines. Two to three times more coolant flows through the new power plants than in engines of previous design. Bores are surrounded by wide water channels for their full height. To overcome short life ex-

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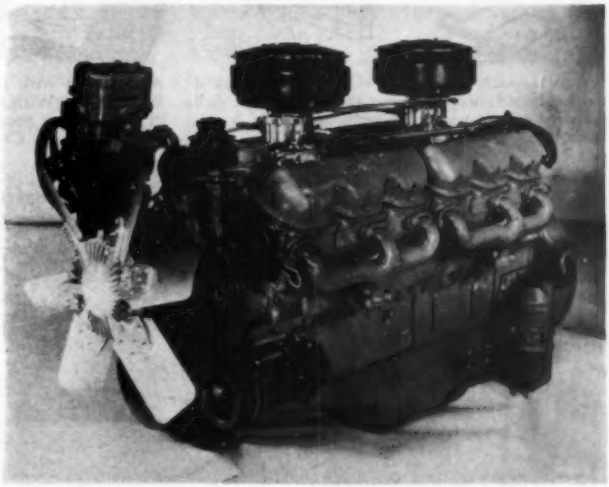
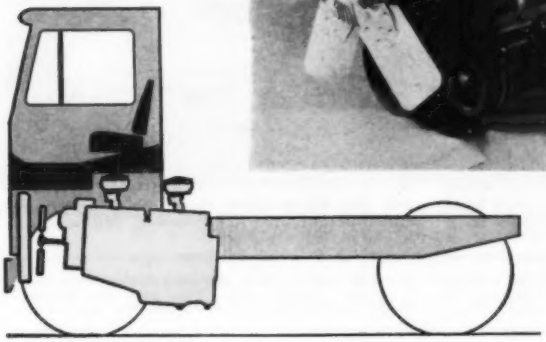
Whopping V-12 will give the big babies plenty of hill power

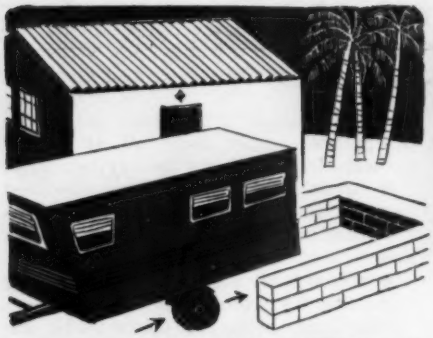


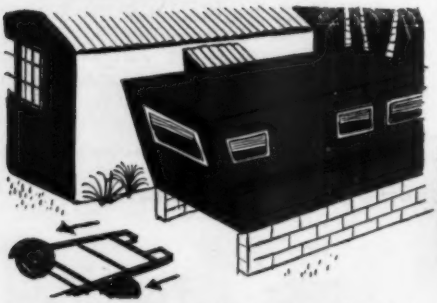
TWO CARBURETORS, synchronized so throttle openings match, and mounted on separate manifolds, are used on V-12. Each has its own hydraulically actuated governor. Crankcase ventilation is boosted by manifold vacuum.



LOW CONTOUR fits twin-six neatly under seat of exceptionally short cab. General Motors considers its new family of engines the first major progress in U. S. truck-engine design in more than 20 years.

"I'd like to see them make..."





A DOUBLE-USE TRAILER. In winter, you'd park it over a foundation, slide out the chassis and pull out a weatherproof seal from trailer to house door.—*A. Dorman, Everett, Wash.*

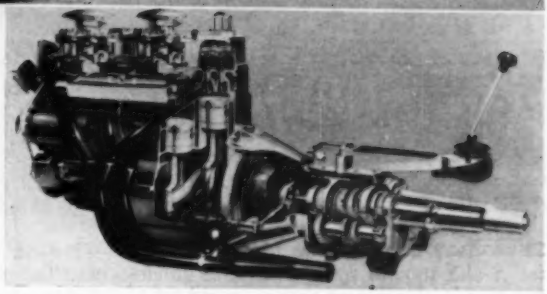
A FLEXIBLE TROUBLE LAMP. A magnetic baseplate would conveniently cling to any part of the car to shed light without glare on the job at hand.—*Chas. Omartoucheski, Linden, N.J.*

A BATHTUB with its drain at the end opposite the faucets. With the water running the length of the tub, it would be simpler to clean and rinse it.—*John Cronn, North Platte, Nebr.*

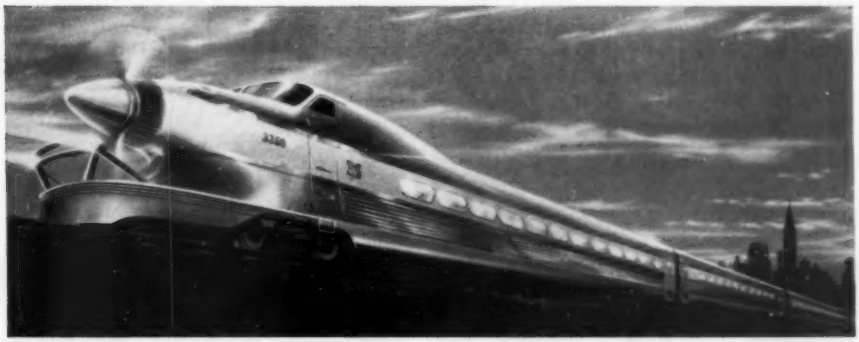
CAMOUFLAGED COOKIE BOXES. Labeled "macaroni" or "dried beans," maybe the goodies would stay around long enough for Pop to get a hand in the box.—*James Martin, East Orange, N. J.*

VACUUM-PACKED SAFETY MATCHES. Packed in the can head down, with a striking surface inside the lid, matches would remain safe, dry and rodentproof.—*Ray Shoberg, Milwaukee.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.



SUNBEAM ALPINE. This little convertible is specially designed by British Rootes for sale in the United States beginning next month. It is said to combine performance features of continental sports cars with Detroit-type comforts and refinements. These include a wraparound windshield, large bucket seats, a folding seat in back, extra luggage space, disk brakes and either disk or wire wheels. The four-cylinder, aluminum-head engine is shown at right with its gearbox. It develops 83.5 hp. at 5,300 r.p.m. The little car is 155¼ inches long on an 86-inch wheelbase. It is 60½ inches wide, 51½ inches high and rides 5⅛ inches off the road.

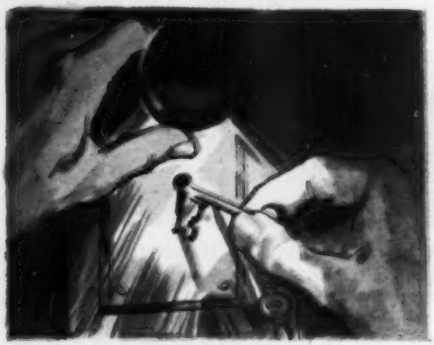


PROPELLER TRAIN. Here's a new kind of train. Its locomotive is driven by a turboprop, like an airplane. Curtiss-Wright designed it as a three-car unit to carry 276 passengers and reduce time on runs of 300 miles or longer. Engineers say it would cut 10 hours from Chicago to Los Angeles. A working scale model will be shown soon at fairs in Europe.

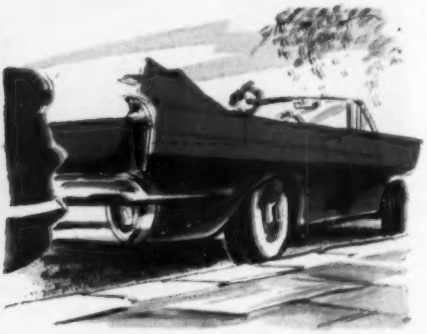
New Ideas from the Inventors

Slide Seat Delivers the Mail. Tracked for a side-to-side movement, the single car seat in this recent patent would let a mailman reach right-side boxes by sliding —instead of wriggling—the width of his car. To move right he'd release a catch that would normally lock the seat in driving position, to prevent accidental sliding.

Key Lights Keyhole. Touching any metal on this latch with your hand or key would complete a high-resistance electrical path to ground, allow a tiny—and completely safe—current to flow through a neon glow lamp. The light would eliminate any keyhole fumbling.



Retractable Fins Ease Parking. For those who want the speedy, stylish look of high tail fins, but find they sometimes interfere with the back-up view, these up-or-down fins might be the answer. They could be operated by a motor or air-lifted by the car's motion.



Saw Guide Limits Cut. You could make accurate, uniform-depth kerfs for grooves and dadoes with an ordinary handsaw if you had an adjustable stop like this clamped to the blade. The depth gauge would fit any saw, could be quickly demounted for long-stroke sawing.

Tray Levels with You. By holding the tray level on your lap, a new adjustable base could make it easier for you to balance a buffet meal and keep liquid from spilling over the rim of a cup or glass. The base could be set for any lap angle, would fold flat for stacking.

Tree Shaker Speeds Fruit Harvesting. Nudged by a tree-trunk vibrator, ripe fruit would fall free of foliage and branches to make harvesting easier and more efficient. You'd mount the shaker on a hollow tractor boom and the air-driven piston that delivers its punch would be controlled by magnetic valves.

CONTINUED

More Inventors' Ideas

Furniture Stop Protects Walls. Stains on the paint or wallpaper that result if furniture gets shoved—or simply inches its way—against a wall might be prevented by an adjustable foot like this. The stop could be raised for cleaning or swung underneath and out of sight.

Knife Sizes Cake Slices. With this two-bladed cutter you could easily serve up a uniform, crumble-proof cake wedge every time and transfer it to a plate without toppling the slice or disfiguring the icing. The separating angle between the two saw-edged blades would be adjustable for large or small slices of cake, pie or other soft foods.

Gun Light Illumines Target. A guard or a sentry could sight his target as quickly as he could light it, with two converging-beam flashlights bracketed to the barrel of his revolver or rifle. The lights would straddle—but not obscure—the sights, and the combination would keep light and weapon equally handy.

The following patents *have been issued on these inventions:* **Car seat**—*No. 2,858,877 to R. Krause, Clintonville, Wis.;* **Latch**—*No. 2,767,303 to A. Romney and C. Monin, Niagara Falls, N.Y.;* **Fins**—*No. 2,877,046 to L. Funk, Indianapolis;* **Saw guide**—*No. 2,769,470 to R. Akers, Portsmouth, Ohio;* **Tray base**—*No. 2,877,073 to A. Malmer, Blue Island, Ill.;* **Tree shaker**—*No. 2,769,298 to J. Jones, Portland, Ore.;* **Stop**—*No. 2,769,275 to R. Lindgren, Minneapolis;* **Knife**—*No. 2,770,035 to G. O'Brien, Jersey City;* **Gun Light**—*No. 2,769,895 to C. Boord, Martin, Pa.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

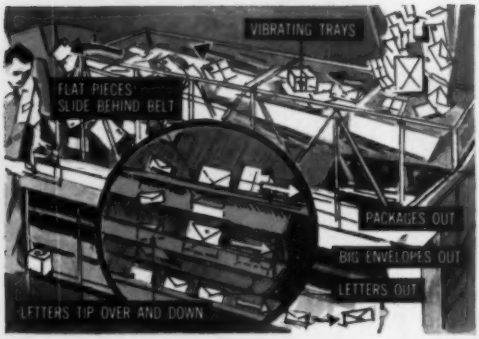
SCHOOL BUS. This one takes the classroom to students, not students to classes. It provides driver-training practice for schools too small to afford dual-control cars or other expensive equipment. Driving situations are shown on a movie screen at one end of the bus while student reactions in "cars" on the aisle are checked by the instructor. He also drives the bus.

ROBOT POST OFFICE. In the booth above are coin machines for buying stamps, money orders in certain denominations, a phone and a change maker. It's being installed in some French resorts.

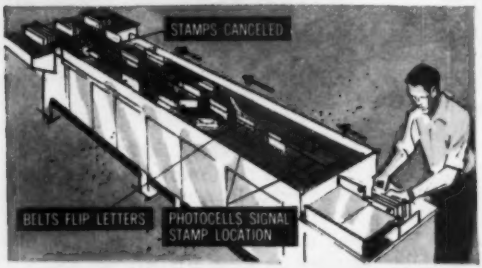
AQUA BOBBER. Here's something new in water sports, from a Maumee, Ohio, maker. The fiberglass ball is weighted to stay mostly upright. But a rider in the crow's nest can swing it in an arc that sometimes ends in a splash.

BIG PACKAGE. Now they're wrapping locomotives in plastic bags. The huge covering on the diesel at left is expected to keep it looking like new when delivered to its purchasers in Brazil. It was made by Canton Containers, Inc., to prevent damage from salt spray during the trip from the U.S. makers.

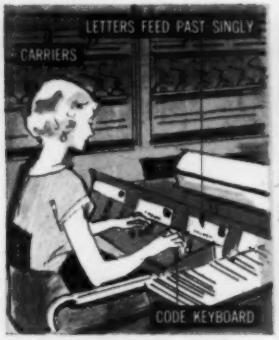
Mechanical Post Office

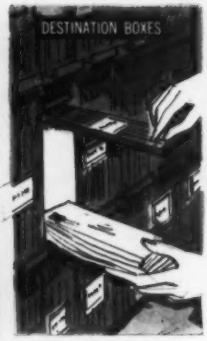


CULLING MACHINE picks ordinary letters out of raw mail, rejecting "flats" (big envelopes), "rolls" (rolled-up papers) and packages. It works like a sieve. Raw mail is spread out by vibrating trays, then slid down sloping panels. Tiers of conveyor belts run along slope, spaced out from panel to pick off big pieces and let only smaller letters slip by to bottom conveyor.

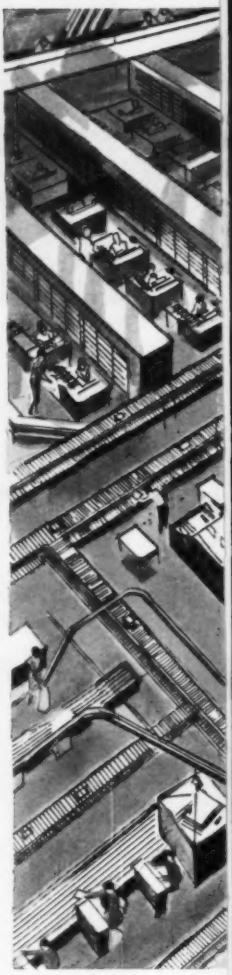


FACING MACHINE flips letters to get them into orderly stacks, with addresses and stamps all lined up. Electric eyes control the flipping by looking for the stamp (which reflects less light than the envelope) and routing envelope to conveyor that will flip it in desired direction.





SORTING MACHINE distributes letters among 300 destination boxes. Operator reads address and punches corresponding code as letter goes past into carrier on belt. Machine computes time required for that carrier to reach destination box indicated by code. When time is up, destination box triggers nearest carrier and gets its letter. Clerks empty boxes when they're full.

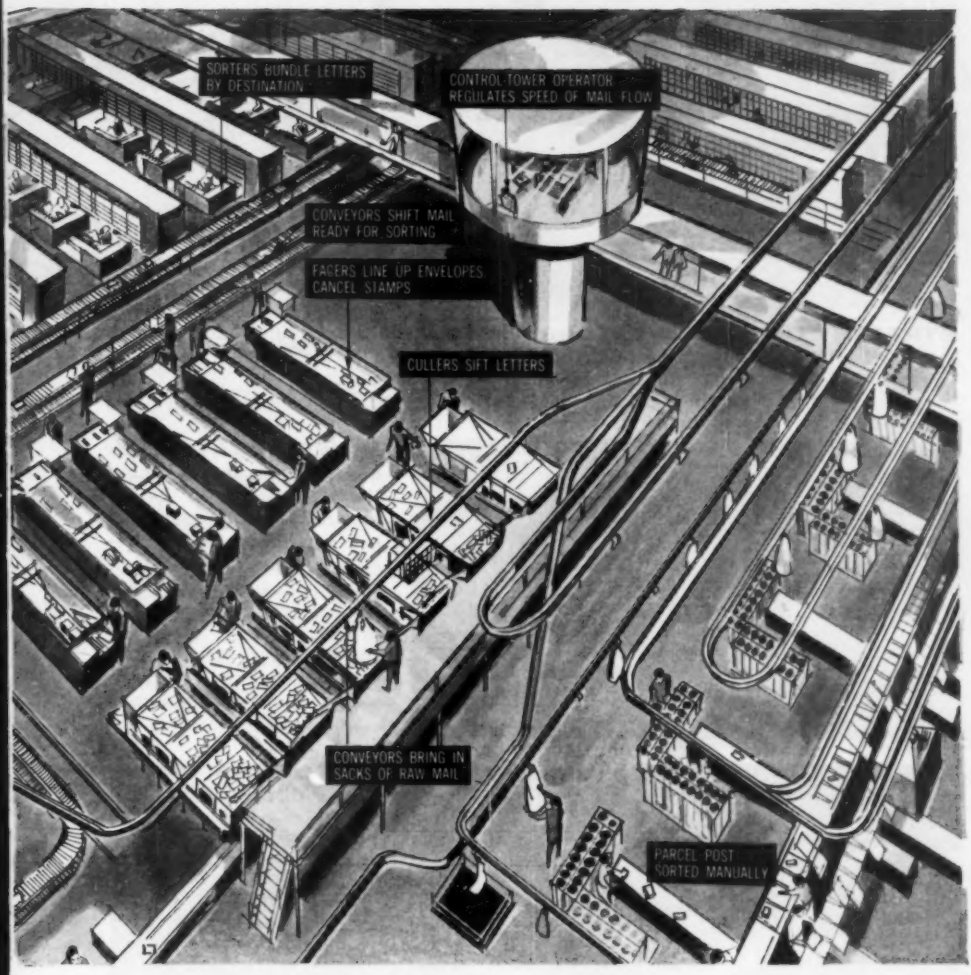


MAIL it today, delivery tomorrow. Such jet-age service is coming closer as uncannily intelligent machines take over the handling of your letters and packages—now up to 60 billion a year and increasing another two billion every year.

These machines will "cull" the mail, separating letters and packages, then "face" the letters—flip them around so that the addresses are right side up—cancel the stamps, and sort them according to destination. Today this processing is done almost entirely by hand, not much different from Ben Franklin's day—and not much faster, either. Eliminating these antiquated methods is also expected to help put the Post Office on a self-supporting basis.

A big new sorting machine, Belgian-

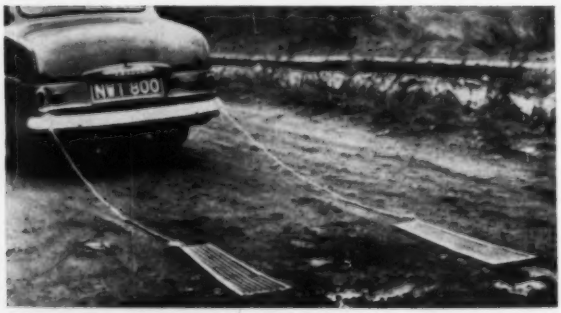
Will Speed the Mail



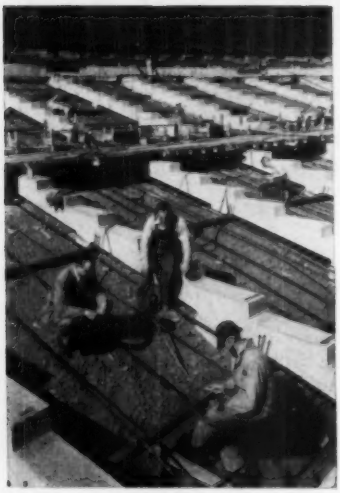
built, has already been installed in the Washington office. But the showpiece of postal automation will be a brand-new plant (shown in drawing above) now being built by International Telephone and Telegraph in Providence. Near airport, railroads and highways, it will use a battery of machines to rush mail through.

The Post Office will spend $15,000,000 researching better schemes this year, including $439,000 for a machine that can read typewritten addresses electronically. Farther off are phosphorescent or magnetic codes (such as the one soon to be used on bank checks) that machines could read easily. Eventually the Post Office might do away with old-fashioned letters entirely, transmitting mail electronically by teletypewriter or facsimile. They're looking into it.

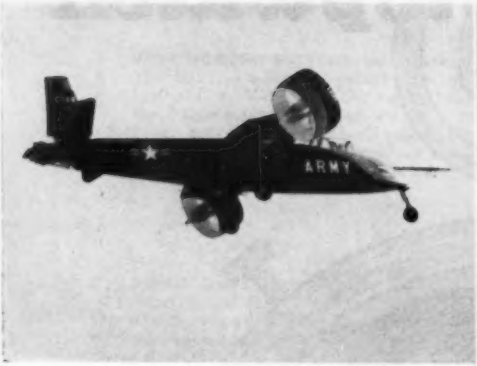
STRAIGHT UP AND OVER. Here's the first flight of the Army's much-talked-about Doak. With ducted props rotating on its wing tips in a horizontal plane (left), the unusual aircraft takes off vertically like a helicopter. The pilot then swivels the fans to the front and goes into high-speed

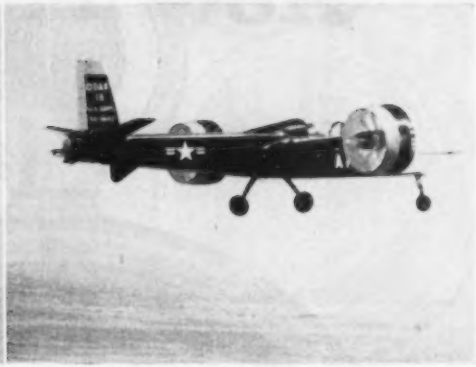


WHEEL MATS. The gadgets being towed behind the rear bumper of the car at left helped to get it out of the mudhole in the foreground. Made in Britain of expanded metal, they are slipped just ahead of the driving wheels of a car stuck in mud, wet grass or snow. The chains drag them along behind until a stop is made on firm ground.



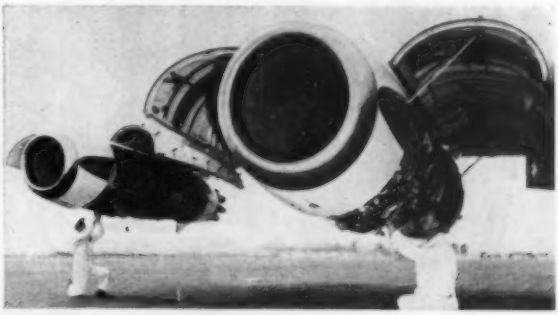
HOT SEAT FOR GIANT FANS. When the Giants open their new baseball stadium (shown in model below) in San Francisco's Candlestick Park this month, fans will be warmed by their seats in the cool night air. Workmen at left install pipes that will circulate hot water under 20,000 seats in the reserved section to provide radiant heat. More than 35,000 feet of ¾-inch wrought-iron pipe form a warm grille on 18- and 48-inch centers below the precast concrete. The system has its own boiler. The stadium will also be used for football this fall.





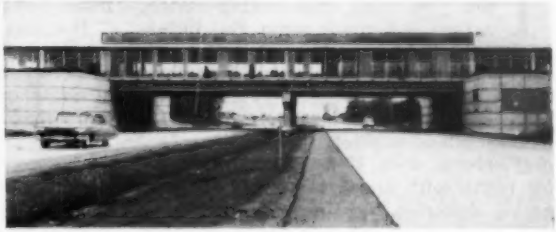
forward flight like a conventional airplane (above). Vertical landing is accomplished by reversing the process. By manipulating the props, the Doak can be slowed down to stationary hovering at 3,000 to 6,000 feet. It turns and backs on the ground like an automobile.

OPEN POD. With doors swung wide, powerful engines on the Convair 880 jet airliner are easy to reach and service. Separate doors on the pylons suspending the engines provide access to fuel lines, hydraulic and electric conduits. The airliner is powered by four CJ-805-3 jets, GE's commercial version of its J79, each with a thrust of 11,200 pounds.



ATOMIC LIGHT. A switch lamp (left) installed by the Pennsylvania Railroad at Altoona, Pa., is expected to last 10 years without attention. Its bulb contains radioactive krypton, giving off beta particles that glow as they hit a zinc sulphide phosphor coating.

ROADHOUSE. Diners in the restaurant at right can relax as they watch the cars go by. The building straddles the Tri-State Tollway near Lake Forest, Ill., has entrances from both lanes. It's in a sealed-glass enclosure that keeps out road heat and noises.



How a Stopwatch

THINK of a stopwatch and chances are you think of a boxing match, a race, a football game. But industrial time-study experts—not sports officials—use most of these little tickers.

The average stopwatch (typified here by a Swiss Heuer) has seven jewels. Its balance wheel oscillates five times a second when at work. Fancy timers may run for hours with the balance wheel alternating direction 10 times a second.

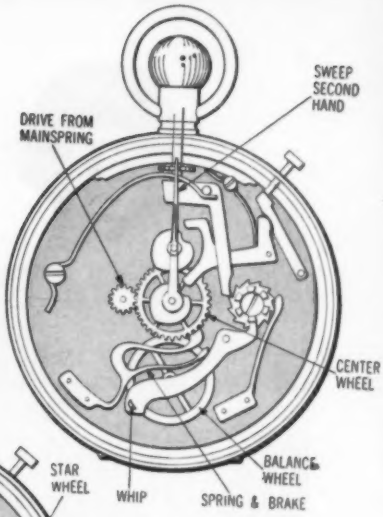
A good stopwatch has rate-regulating parts made of an alloy that's nonmagnetic and unaffected by temperature.

It compensates for position, timing accurately whether it is vertical, horizontal or at an angle. To get a U. S. Bureau of Standards rating, it must deviate no more than six seconds in six hours.

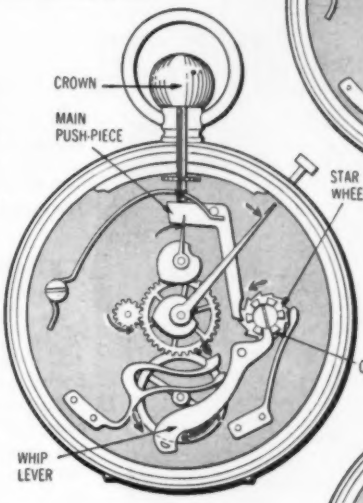
A stopwatch should be wound before each use. Its worst enemies are dirt, dust and chemical vapors that infiltrate the case. Perfume vapor is especially bad—it dries up the lubricating oil.

Works

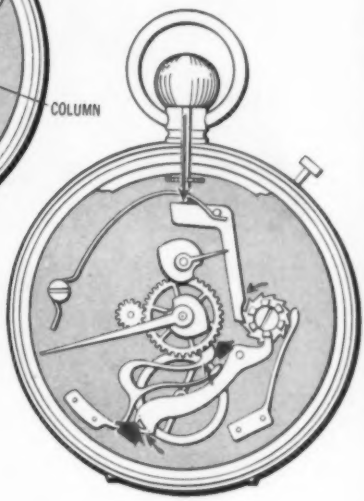
1 **WITH NOTHING MOVING,** the watch looks like this. The balance wheel—driven by the main spring—is held still by the whip. The center wheel, geared to the balance wheel, is snubbed by a brake. Braking action prevents the center wheel and its attached sweep-second hand from taking a momentary backward lurch at the instant a finger jab starts the timing cycle.

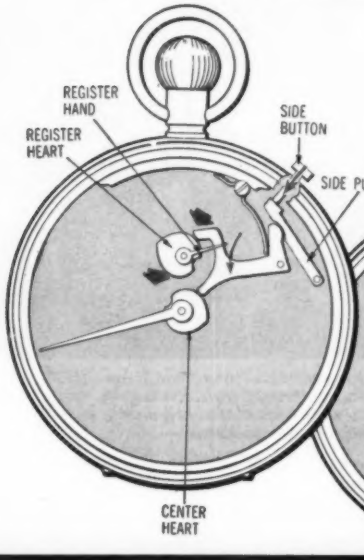


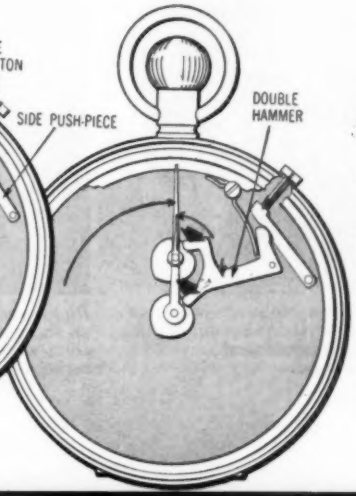
2 **PUSH ON CROWN** starts the watch. The stem presses the spring-loaded push-piece downward (it slides but doesn't pivot). This rotates the star wheel, advancing it one tooth. As the star wheel moves, the whip lever slips off a column on the star wheel and falls between columns. This pivots the whip away from the balance wheel, freeing it, the center wheel, and sweep-second hand. Simultaneously, the whip lever's movement releases a brake resting against it. Now the center wheel is turning.



3 **SECOND PUSH ON CROWN** stops the watch for time out. The hands stay where they're stopped. Forced down by the stem, the push-piece rotates the star wheel another tooth. The whip lever slides out of its resting space between columns and rests on the outside of one column. Pivoting, the whip again stops the balance wheel while the brake snubs the center wheel.







4 **PRESSING SIDE BUTTON** returns the hands to zero. The button's stem pushes down a second spring-loaded push-piece. This pivots the hammer, whose yoke-shaped end rides on hearts—one heart for each hand. In pivoting, the hammer jabs the two cam-shaped hearts and spins them around. The hearts stop when a notch in each of them reaches the hammer. Notches are exactly positioned so they come to rest against the hammer when both hands point to zero.

The Outfit Where

PHOTOS BY W. W. MORRIS

He can hardly walk, but he's ready to jump—300 pounds of man and gear. The extra-equipment bag covering him from the waist down releases automatically as he hits the ground.

Hercules C-130, fast new Air Force

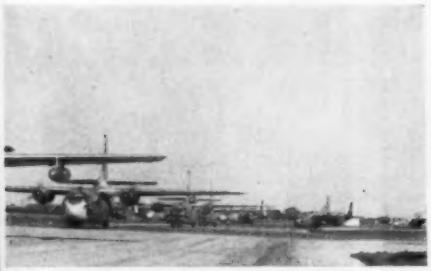
THEY call themselves the Screaming Eagles. They're the combat-alert spearhead of the new Strategic Army Corps (STRAC). The parachute is their best friend.

In the 101st Airborne Division everybody jumps: the generals, the cooks and chaplains—even the paymaster who hands out extra paratrooper paychecks to the men making their first jump.

As an observer during a recent

Plane-loading lists are made up on an Addressograph. Each man carries his own plate with name, serial number and unit.

Everybody Jumps



turboprop, carries 64 paratroopers.

battle-group maneuver at the Fort Campbell, Ky., home of the 101st, I learned that the life of a paratrooper is a tough one—aside from the actual jump. The training of a combat soldier must prepare him for every situation.

Most of the men, all volunteers, like to jump. Almost all admit they're scared at the moment of stepping out into the void from a speeding Air Force plane.—*Herbert O. Johansen.*

Men and equipment float leisurely down in a mixed drop. Each man wears an emergency chest chute to pull if pack chute fails.

As he touches ground (top photo) trooper tumbles in good form, gets up to collapse chute, stumbles and is dragged as a buddy grabs for the shrouds. Free of chute, he struggles out of gear.

CONTINUED

When the jump is over,

Mobile communications center is vital to fast-changing paratrooper operations. This air-droppable van handles telephone, teletypewriter (wire and wireless), voice and code radio, with a range of more than 1,500 miles.

At Hellcat Trail, patrol leader uses a new helmet radio to pass deployment orders on to his men. Transistorized, it has a normal range of 500 yards, sometimes reaches four miles. There is a 12-channel choice.

"Recondos" (reconnaissance commandos, doughboy) are elite of airborne unit. They can handle poisonous snakes, put an alligator to sleep by rubbing its belly.

Poncho package waterproofs clothing and weapons, serves as raft for men crossing a river.

the paratrooper becomes a combat soldier

Bazooka team digs in fast to guard a road against enemy infiltration.

Up to nine chutes are used to drop heavy stuff like M-56 antitank weapon.

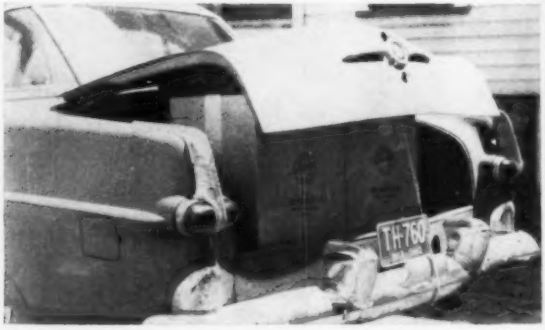
Free fall—when a gust prematurely triggered the automatic chute release—junked this Jeep.

Karate (an offensive judo), cliff climbing and star navigation are other Recondo specialties.

Field shelter can save a man's life. Poncho over branchwork makes snug bed. Maj. Lewis Millet (right), one of Army's toughest, is a Medal of Honor holder.

New Rustproof Paints Come in Spray Cans

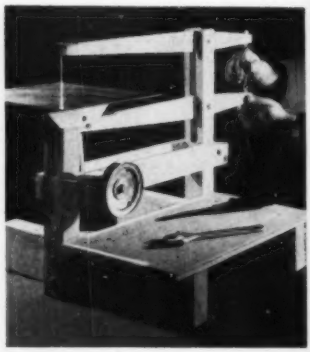
To make it easier and faster to get rust-inhibiting paint into hard-to-brush spots, you can now buy Rust-Oleum in pushbutton spray cans. Two other new finishes are Galvinoleum, made to prevent flaking of galvanized metal such as gutters, and a clear rustproofer for car chrome and other brightwork. Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.



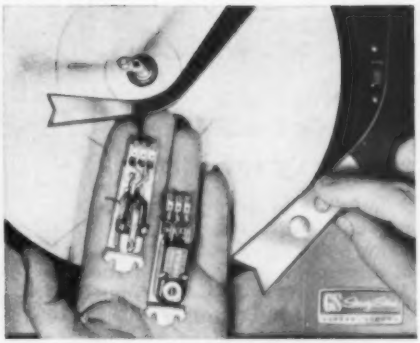
SPRING HOLDS TRUNK LID. This spring-tensioned tie-down hooks to your bumper to hold a trunk lid snug when you lug oversize loads. About $1, Ohio Products Co., Box 1, North Madison, Ohio.

JIGSAW KIT of precut hardwood parts can be assembled with only a screwdriver and wrench. The blade, with a 15½"-capacity throat, is stretched taut between two bronze-bushed rocker arms.

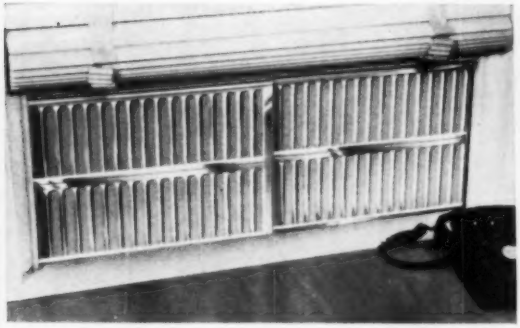
A ¼-hp. motor can be bolted to the platform to power the tool. About $15, Henlon Corp., Vestal, N.Y.



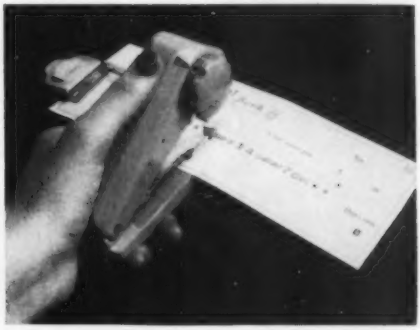
TINY OXYGEN TANK can be carried by heart and respiratory patients for emergency relief. Oxygen comes in replaceable cartridges. Wilmar Pharmaceuticals, Box 10264, New Orleans, La.



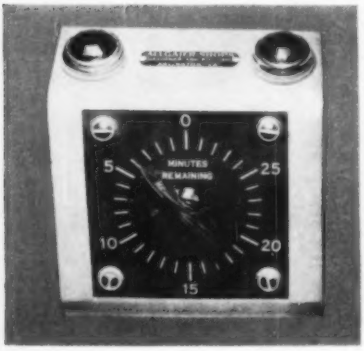
QUICK-SWITCH HI-FI. Two pickups prewired to snap-in holders let you switch quickly from mono to stereo records with this new changer. Glaser-Steers, 8 Main St., Belleville, N. J.



POLLEN-PROOF SCREEN, made of foam plastic, is said to filter out 79 percent of dust and pollen. It telescopes to fit stock window widths. About $4, Safeguard Corp., Lansdale, Pa.



MIDGET CHECK WRITER stamps erasure-proof checks like big office machines, yet fits in a pocket. Made for homes and small businesses, it's $10. Enraco, 913 Forest Ave., Evanston, Ill.



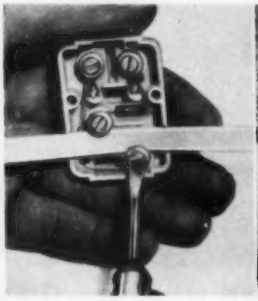
TALK STOPPER at left warns a long-winded speaker with an amber light when there's one minute to go, a red light when time's up, then a loud buzz. Allgaier Shops, Arlington, Va.

PAINT CATCHER at right is a flexible neoprene ring that slips over a paintbrush for overhead jobs. Sizes for 2½" to 4" brushes: Whiz No-Drip Co., Box 331, Blytheville, Ark.

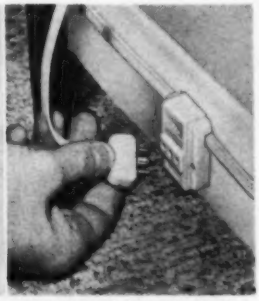
CONTINUED

TV Sets Plug in Anywhere

Portable TV sets can be really portable with new plug-in antenna outlets that you can mount in any room or out on a patio. An amplifier boosts signal strength so you can run several TV sets or FM radios at the same time from one antenna. A kit including plugs, outlets and amplifier costs $67.75. Jerrold Electronics Corp., 15th St. and Lehigh Ave., Philadelphia.



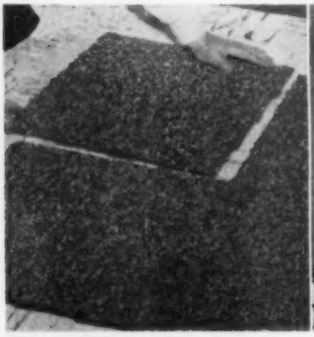
OUTLETS clamp to antenna lead-in with screws that bite through the insulation, making contact without requiring any wiring.

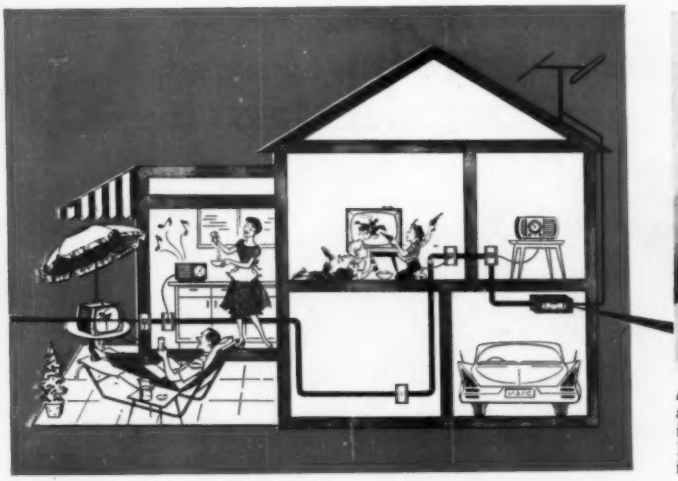


PLUGS, quickly attached to TV sets, fit into wall outlets. Outlets can be surface-mounted or concealed in wall boxes.

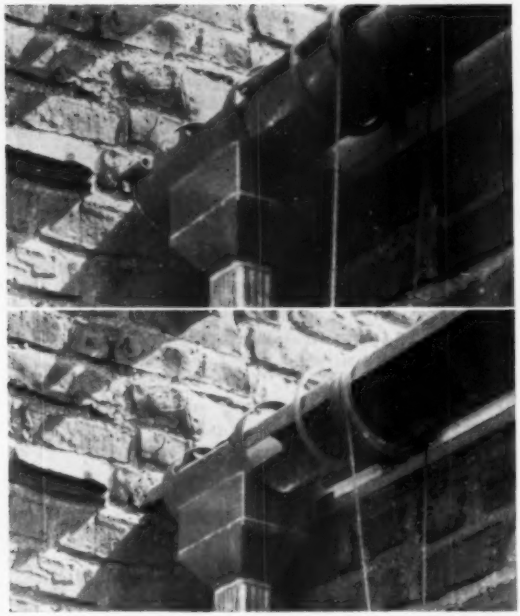
SAW FILER is said to let you sharpen circular blades at a fraction of the usual cost. A file is held in a wood base that slides in a track bolted to your miter gauge. By adjusting the miter angle and sliding the jig, you can file face and back bevels on rip, crosscut and planer blades. About $6, Martin Saw Filer, 539 Greenleaf Dr., Monroeville, Pa.

NEW CARPET SQUARES can be shifted around as they wear or to change colors. The 18" squares have interlocking backs of hardboard (center) that can be laid over any surface, even concrete. For added touches, inserts of ceramic or vinyl tile can be fitted in (at right). They come in standard or custom colors for $8 up per sq. yd. Jaystron Corp., 1760 E. Market St., Akron, Ohio.





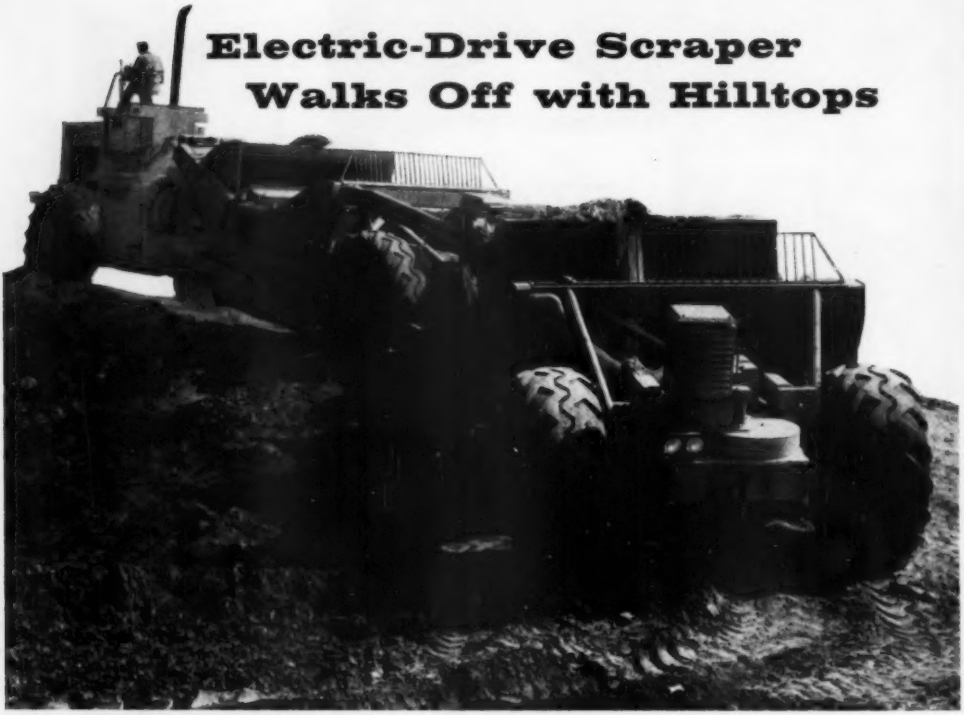
AMPLIFIER, hidden in garage or attic, magnifies antenna signal so it can handle many sets at once. It's also said to improve reception in areas where signals are weak.



SELF-CLEANING GUTTERS. Instead of climbing a ladder to clean out these gutters, you just stand on the ground and pull a rope. This rotates the entire gutter, held in circular hangers, so that leaves and debris fall out by themselves. About 90 cents a foot in galvanized, $1.70 in copper. Ralph Tripp Co., 14 N. Harrison St., East Orange, N. J.

HORN STOPPER. If your car horn sticks or shorted wires start a fire, you can quickly disconnect your battery by unscrewing these knobs. The knobs screw into threaded spiders forced over the terminals and are held in oil-filled cups to prevent corrosion. They're about $4 a pair from Terminals, 22700 Martha St., Woodland Hills, Cal.

Electric-Drive Scraper Walks Off with Hilltops



"YOU don't steer this thing," says the driver of the newest earthmover. "You just punch buttons and hang on for dear life."

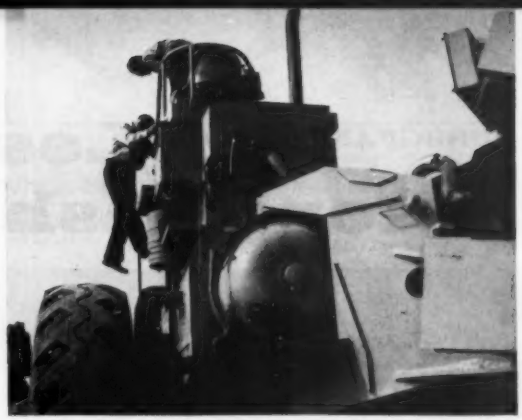
The 70-ton Le Tourneau scraper has an all-electric drive. Pressing a button, the driver revs up the 600-hp. Cummins diesel that powers one AC and one DC generator. Another button starts the 75-foot-long giant lumbering up a hill as steep as 45 degrees. All eight wheels move simultaneously, each powered by its own DC motor.

"It's like having eight bulldozers working for you," a construction boss says. "There's practically no terrain too rough for these babies; they don't need any assists from pusher dozers, either, as some of the big ones do."

The driver steers by means of an AC motor on the front of the second unit. This motor drives a gear in mesh with a

ICY SPRAY. Hovering in an artificial blizzard, a Bell helicopter tests its rotor de-icing equipment. Icy blast is spewed by 143 spray nozzles mounted on a 50-foot tower that can be rotated to line up with wind direction. The spray rig, a Canadian government installation, atomizes water with steam; cold weather does the rest.

PUSHBUTTONS control the diesel, two generators, working parts of both digger units and lights. Turning the big knob (center) varies wheel speed. Flicking a switch changes direction—there's no steering wheel.



DRIVER RIDES ATOP POWER UNIT. Toothed semicircle at rear of power unit is steering sector driven by a gear on the second unit. Above sector is one of the generators.

A BEEFY DC MOTOR like this powers each of the scraper's eight wheels. Individual drive on each wheel eliminates clutch and differentials. The huge tires measure six feet in diameter.

sector on the rear of the first (power) unit. By swinging the sector, the gear pivots the entire two-wheeled power unit.

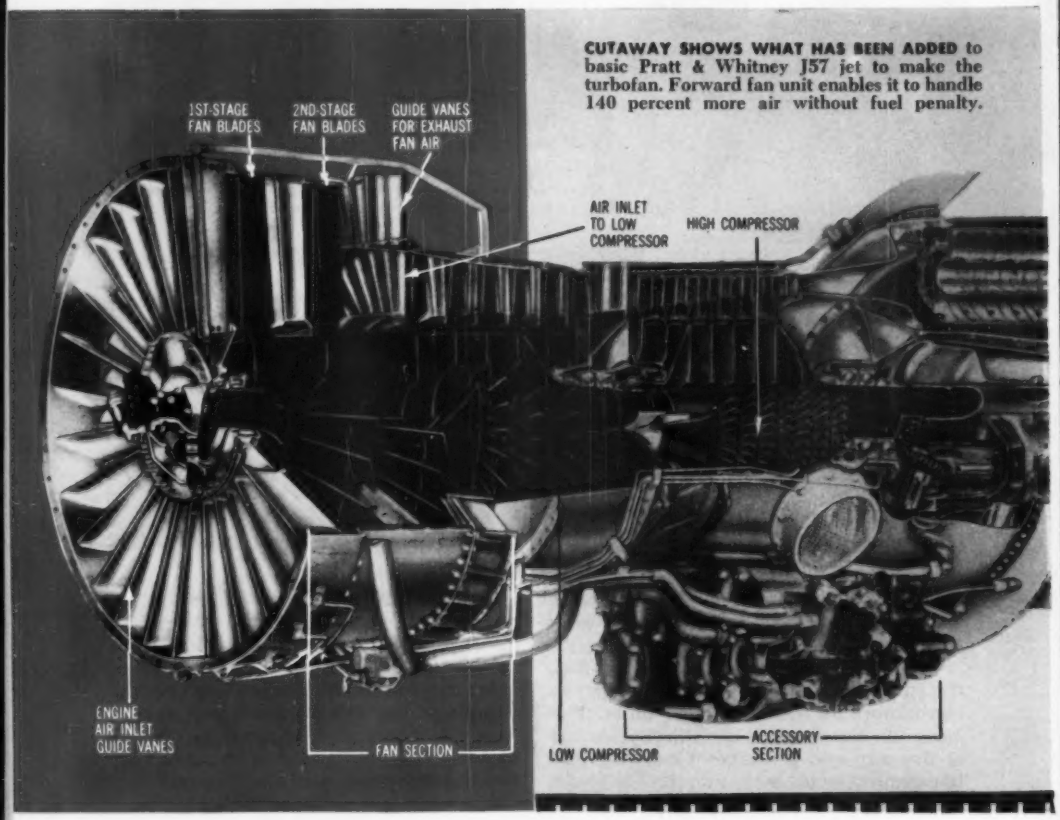
When in position to scoop up dirt, the driver punches control buttons to run motors on the two digger units. The apron on the front of each unit rises out of the way and a scraper blade dips below ground level. Maximum bite is about 18 inches; the rear-unit blade, of course, is set deeper than the front one.

Driving forward with power on all eight wheels, the earthmover slices into the hill. Dirt, up to 55 tons of it, fills the diggers. Motors then raise the blades, lower the aprons. While crawling over the dumping site, aprons are again raised. Now the tailgate on each digger moves forward. Shoved like a ram, it pushes the dirt out the front onto the ground.

There are five of these $135,000 mountain movers at work in the U.S.

RESEARCH HYDRO. New marine materials are being tested in an unrestricted-class hydroplane built by industrialist-sportsman Robert Evans of Detroit. The hull panels are unsinkable sandwiches of mahogany, epoxy-glued to an expanded, plastic-foam core. Twin props are powered by two 12-cylinder 1,800-hp. engines.

TURBOFAN ENGINES: Less Noise, More Push for Jets



CUTAWAY SHOWS WHAT HAS BEEN ADDED to basic Pratt & Whitney J57 jet to make the turbofan. Forward fan unit enables it to handle 140 percent more air without fuel penalty.

By Herbert O. Johansen

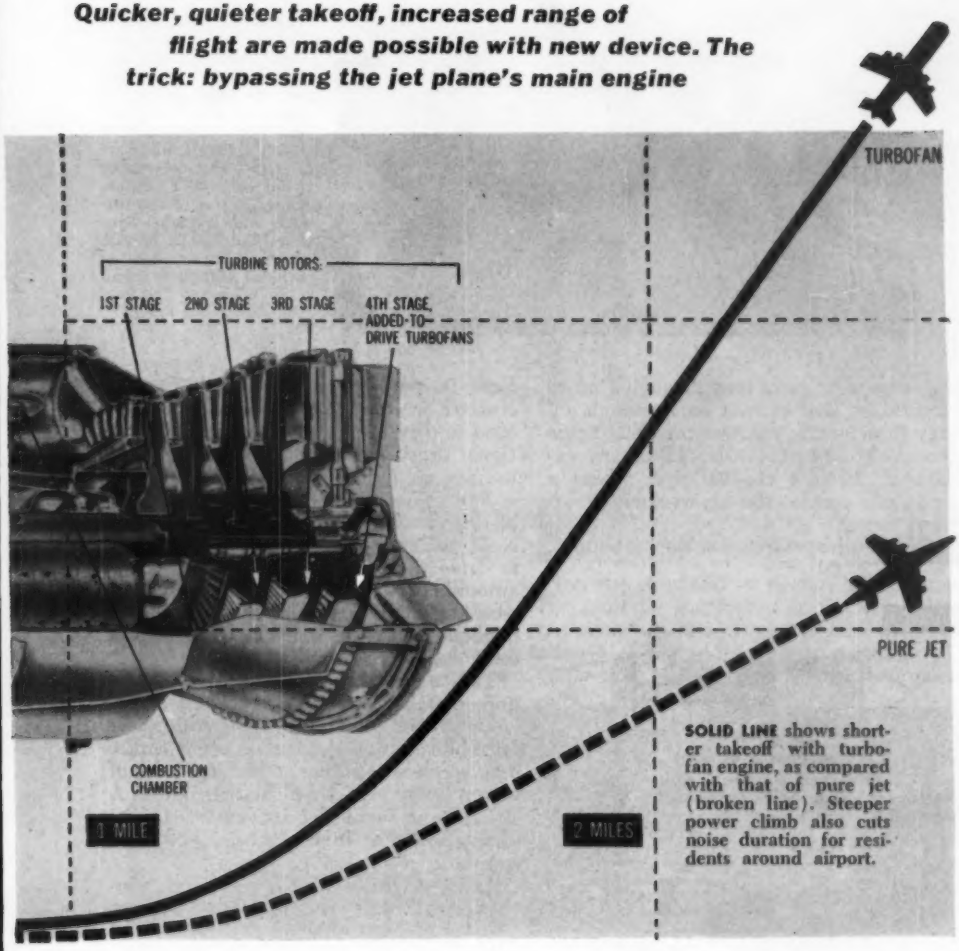
THE turbofan is a device almost as simple as the exhaust fan in your kitchen. It will increase the range of subsonic military and commercial jet planes by several hundred miles, and enable them to take off from shorter runways with less noise.

Using a series of oversize blades that gulp vast quantities of air, the turbofan, hitchhiking on a straight jet engine, acts somewhat like the propellers on conventional planes. The development is hailed by its advocates as comparable in importance to the supercharger in piston-engine progress.

First application probably will be on a new version of the eight-engine B-52 jet bomber, extending its range by as much as 500 miles. Scheduled for this is the Pratt & Whitney forward turbofan arrangement shown in the cutaway at the top of these pages.

Interest being shown by commercial airlines in the forward turbofan, as well as in an aft-fan version developed by General Electric, makes it a good bet

Quicker, quieter takeoff, increased range of flight are made possible with new device. The trick: bypassing the jet plane's main engine



SOLID LINE shows shorter takeoff with turbofan engine, as compared with that of pure jet (broken line). Steeper power climb also cuts noise duration for residents around airport.

that they'll be powering passenger jets within two years. A British counterpart, the Rolls-Royce Conway bypass engine (ahead of ours in development) has been specified by several airline customers for installation on their U. S.-built jets.

The turbofan is a power booster, *not* a speed booster. In fact, its limit of usefulness ends at about 95 percent of the speed of sound—which is about as fast as our commercial jet planes will be flying for some years to come.

What appeals to the airlines is that they will get increased performance without engine replacement. The turbofan components can be added to a basic jet engine in an overhaul shop. Although complete turbofan engines will be available from the manufacturers for installation on new planes, both Pratt & Whitney and GE promise conversion kits.

How it works. First let's take a look at what goes on in a pure jet. Air taken in at the front end goes through compressors that build up pressure. The compressed air then enters a combustion chamber where it is mixed with fuel and burned, creating heat (energy). Next the

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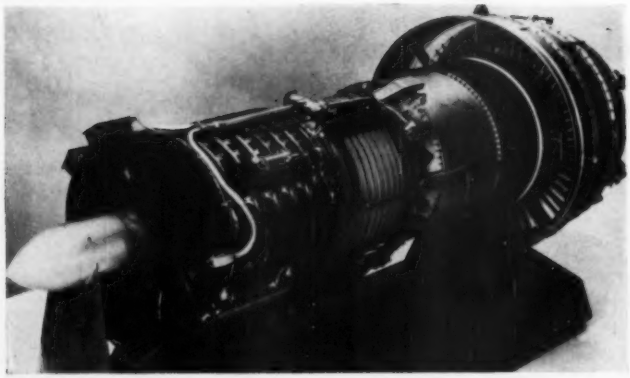
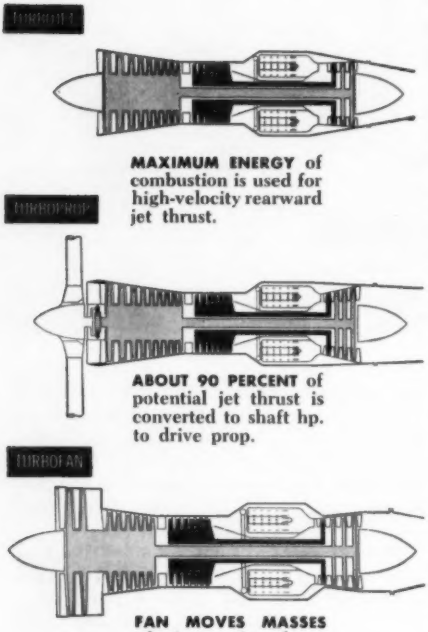


TURBOFAN SECTION is at rear in this GE version. Principle of operation and advantages are the same as for the forward fan. A free-floating turbine rotor is aerodynamically driven by exhaust gases from the main engine. Outer halves of the turbine wheel "spokes" are fan blades that handle the bypass air. Slower exhaust cuts jet noise.

hot, expanded gases pass through a series of turbines that extract only enough energy to drive the compressors and engine accessories. Most of the gases are exhausted through the tailpipe, where a jet nozzle creates the high-velocity rearward thrust.

At the other extreme is the turboprop.



MAXIMUM ENERGY of combustion is used for high-velocity rearward jet thrust.

ABOUT 90 PERCENT of potential jet thrust is converted to shaft hp. to drive prop.

FAN MOVES MASSES of air to give thrust without robbing gas-turbine energy.

Here 90 percent or more of the energy created in the combustion chamber is used to drive a shaft that spins a conventional propeller. What's left goes out the tailpipe as added jet thrust.

The turbofan is in between. The fan blades, whether forward or aft, rob the basic jet engine of only enough energy to drive the fan blades. The huge extra amounts of air they gulp and exhaust bypass the main engine, creating an independent thrust—as much as 50 percent of total engine power developed.

This extra thrust is available almost immediately the engine is started, shortening takeoff runs and giving full power for climb. In one test run on a GE turbofan, acceleration time from idle to full power was less than six seconds. A straight jet achieves its most efficient thrust power at high altitudes and high speeds.

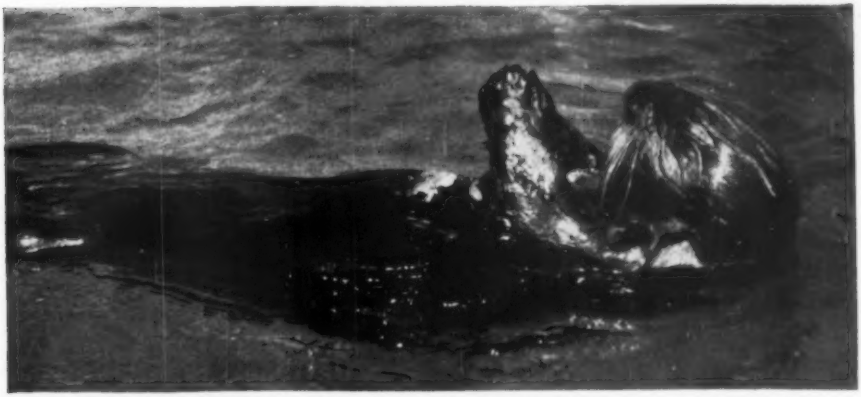
And since this air bypasses the combustion chamber without using fuel, the result is greater range or greater payload capacity.

The extra turbine stage that drives the fan blades slows down the velocity of the tail-exhaust gases, lowering noise levels by 10 to 20 percent.

Exhaustive tests, on the ground and in flight, have convinced engineers that they have the solution to the straight jet's shortcomings at subsonic speeds.

Both GE and Pratt & Whitney each have built seven turbofan engines. Next year more elaborate flight-testing will take place: the P&W on the U.S. Air Force's big B-52 bomber; the GE probably on a Convair 600 jet liner.

CARGO CRUISER. Here's an outsized wagon designed for dealers and salesmen who carry a lot of goods. It's built by Superior Coach Corp., Lima, Ohio, on a special heavy-duty Pontiac chassis with a 148-inch wheelbase —two feet longer than standard—and has 50 percent more carrying capacity. One or two rear seats that fold into the floor are optional.



TOOL-USING ANIMAL. The fun-loving California sea otter, shown above at a leisurely meal, is the only mammal besides man that uses tools. When hungry, the North Pacific native hunts up a small rock, then cracks open clams by banging them against the stone. It rolls over on its back, rests the rock-tool on its stomach, and dines with the indolence of a Roman emperor. Fact is, it is a regal animal, with one of the richest, finest pelts in the world. A single skin sold for a record $4,000. Once nearly extinct, it is now increasing under strict U.S. protection.

Laying on the bat near the wire, charioteers raise a dust cloud. Two men race at a time, using

Chariot Racers Risk Spills for Fun

You need an oil drum, some steel pipe, a couple of nags —and a lot of nerve

CHARIOT racing is making a big comeback after 2,000 years—in Boise, Idaho. The arena: a race track on the local fairgrounds. Every Friday night the stands are crowded with fans who cheer their favorites as loudly as ancient Greeks and Romans did.

These modern charioteers have made a few changes in the age-old sport, however. Only two chariots race at a time, instead of a dozen or more. This prevents murderous pile-ups.

It doesn't make the races kid stuff, even so. Horses have run away when their chariots tipped over on a curve or locked wheels with a competitor. One driver was hurled end over end when the tongue of his cart broke loose and rammed into the ground. He broke an arm and four ribs.

The modern chariot races are probably faster than the Roman ones were. Total distance is a quarter mile and some of the best horses in the West are used—thoroughbreds and registered quarter-horses as well as fine saddle horses. Chariots seldom weigh over 150 pounds; and they have the added advantages of modern running gear and lubricants.

Drivers build their own chariots from junk parts at an average cost of $60 to $75. (Harness runs an equal amount.) The cart is cut from an oil drum, and two-inch steel pipe is welded on the front for a tongue.

Credit for reviving the sport goes to "Ace" Wolverton, president of the 36-man Boise Valley Chariot Racing Association. —*Robert M. Hyatt.*

teams matched for speed.

ACCIDENTS DO HAPPEN: After winning the race, this team wheeled suddenly and headed for the *Win* window, dumping chariot.

STANDS ARE CROWDED with spectators who paid a dollar each to watch the quarter-mile races. Chariots are cut-down oil drums with a solid axle and old auto wheels from the junk-yard. Wheels are set 50 inches apart.

POWERED BY GOATS and driven by a girl, this midget chariot circles the track to provide a bit of comedy between races.

Tension, taboos, or tight collars can all trigger faints

You can conclude from this that fainting is not restricted to females. Men faint, too. Strong men, varsity football players, good soldiers, rugged blood donors, have all been known to collapse.

Technically, physicians define fainting as a sudden temporary loss of consciousness: the result of a shortage of blood and oxygen to the brain. In the old days, a person would say, "the blood drained out of my head."

What triggers it? The causes may be physical or mental. Standing a long time in a hot stuffy room, jumping from a chair or quickly turning your head can make you faint. But so can fright, the sight of blood, anxiety or emotional jolts.

ACCIDENT CAUSE? Many experts think fainting is a "hidden" factor in air and highway tragedies.

Take the case of the Pittsburgh ambulance driver. He'd watched others faint often enough. Then one night he picked up the phone to hear his kid brother, calling from the Caribbean, say he was going to fight for Fidel Castro. The ambulance man fell over in a swoon.

Then there was the Chicago medical student who fainted in front of an exhibit at the Museum of Science and Industry. What bothered him was a sight he would see often in his work—specimens of the human embryo.

Whatever the causes, fainters typically show the same symptoms: They turn pale. Their hands and foreheads become cold and damp. A few moments later color and warmth return. They come to.

The paleness means that blood "drains" from the head. The blood vessels deep in the legs and abdomen expand, the result of complex nerve messages. Blood collects in the dilated vessels. The heart sometimes slows down, sometimes gallops; but it beats weakly. It's as if you suddenly enlarged a well pipe and lessened the power of the pump. Blood pressure falls. Not enough oxygen gets to the brain. Unconsciousness follows.

Who blacks out? Physicians say you can't predict. A seasoned crime reporter at an execution in Sing Sing slid quietly from his bench in the death chamber when he heard the hum of the turned-on current.

Nor does size matter. "Large persons show just as much tendency to faint as do smaller ones," says Dr. Robert Barnard of Cook County Hospital in Chicago. At blood-bank centers he has studied, seven percent of volunteers fainted before, after or while giving blood.

In these cases, Dr. Barnard believes there may be a kind of blood taboo operating—a feeling that the loss of blood is "forbidden." When we see that taboo violated, we suffer such a powerful psychic disturbance that we faint.

But far less deeply centered psychological disturbances can cause faints:

- *Imaginary dangers.* In a London theater, a newsreel showed a man supposedly being run through with a sword. It was explained that this was a demonstration of Hindu magic, filmed for medical experts. Yet some of those in the audience fainted.
- *Hysterical faints.* When a woman fainted one day in a Rochester factory, word quickly spread that there was poison gas in the building. Other women promptly fell over. Physicians said that

Here's first-aid treatment for anyone who faints

If you have repeated fainting attacks, you should consult a physician. But you can often fend off an "ordinary" faint by just lying down. Next best precaution: Sit and lower your head below your knees.

Once someone has passed out, treatment already is underway. Unconsciousness, itself, hastens recovery. By toppling over a victim, Nature puts him in better position for blood trapped in the lower parts of the body to reach the chest and head—it no longer has to go uphill.

But there are ways to help:

- Stretch the person out on his back and elevate his feet.

—then nature takes over

some fainted out of fear, others because of hysteria.

The "hysterical faint" almost always occurs when there is an audience. It's a bid, possibly unconscious, for attention or sympathy.

A Southern girl whose engagement was broken began having fainting spells —always before family or friends. The spells ended abruptly when the couple patched things up.

• *Nervousness.* Sometimes extreme nervousness makes people breathe too deeply and too rapidly. Dizziness sets in and they feel they're about to smother. Sometimes they faint from this "hyperventilation."

A 35-year-old history teacher, nervous about a speech he was to make, collapsed in the hotel lobby during an educational conference. The house physician prescribed a homely remedy. He gave him a paper bag to breathe into. This replenished the lost carbon dioxide and restored the acid-alkaline balance.

• *Extreme happiness.* Sudden joy can kick the pins out from under some people. A basketball coach whose team won the state championship, and a brunette beauty who captured the Miss Universe crown, are among those who have fainted from delight.

These faints stemmed from emotional causes. There are "classic" physical causes, as well:

• *The tight collar.* Fainting can be caused by pressure on certain parts of the body, particularly the neck. A man with a tight collar may faint when he turns his head to park his car.

• *Muscular faints.* Standing rigidly at attention for long periods, or standing around after strenuous exercise may flatten the best of men. Blood circulates more vigorously when the veins are being massaged by moving muscles, less so when the muscles remain entirely idle.

TWO FIRST-AID TIPS: Apply a cold towel to the head and loosen clothing around the neck.

Among the most dramatic examples is that of the busby-hatted British Guards soldier who tumbled over before the Queen's averted eyes.

• *Cold faints.* Heat and fainting are commonly associated; but cold, too, may snap the trigger. A 30-year-old Navy veteran fainted five minutes after swimming in icy water. A 26-year-old truck driver collapsed after a long haul in sleet and snow.

None of these physical causes is grounds for much worry. Really serious cases of fainting—from anemia, epilepsy, brain tumors, varicose veins—are comparatively rare. People mistakenly link fainting with heart disease, notes Dr. George Engel of the University of Rochester. Not so, say the doctors. Few people faint from heart trouble.

Because fainting comes with so little warning and is so quickly ended, few medical authorities are able to observe it from start to finish. But recently a full team of physicians and nurses got their chance. A 36-year-old television commentator was taping a description of an operation—something he'd done a dozen times before. This time he wobbled and struck the floor. "The place was filled with whirling sparks," he recalls. "Then I thought somebody pulled a dark blanket over my head." Doctors revived him and assured him it was nothing.

• Loosen his clothing, especially the collar.
• Apply a cold towel or water to the head.
• Use smelling salts, if available.
• Keep him reclining on his back for at least 10 minutes.

And some don'ts:

• Don't force an unconscious person to drink. He might choke.

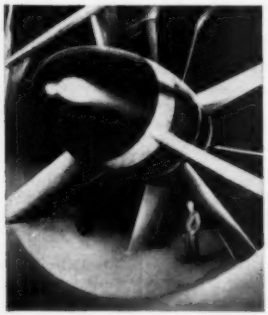
• Don't force him to sit up. It may prolong the unconsciousness.

• Don't use smelling salts or any stimulants if there is bleeding. They may tend to increase the bleeding.

• Don't allow him to stay on his back if there is vomiting. Roll him over, turn his face to the side, forehead on forearm. He'll breathe easier and be less likely to strangle.

PS Picture News

DUAL BOXCAR. Retractable rubber-tired and flanged wheels make this vehicle suitable for both highway and rail travel. The Chesapeake and Ohio has the Railvan in service on its 172-mile run from Grand Rapids to Traverse City, Mich.—as trailer (top) and boxcar (just above).



STORM FAN. A huge propeller (left) in the Ford climate chamber at Dearborn, Mich., gives new cars a hurricane tryout. The big 24-foot-diameter blades can create winds up to 140 m.p.h. by blowing 3,000,000 cubic feet of air through the testing chamber every minute.

JOB SPEED-UP. Workmen in Hamburg, Germany, put up this four-story building in 24 hours with prefabricated sections from Denmark. Tenants moved into 48 apartments in nine weeks.

TWO-TON TIRE. Here's the largest tire ever made—10 feet high and four feet wide. Goodyear built it for big earthmovers, prices it at $14,000. Its rim will weigh another ton.

The Popular Science Split-Level Workbench

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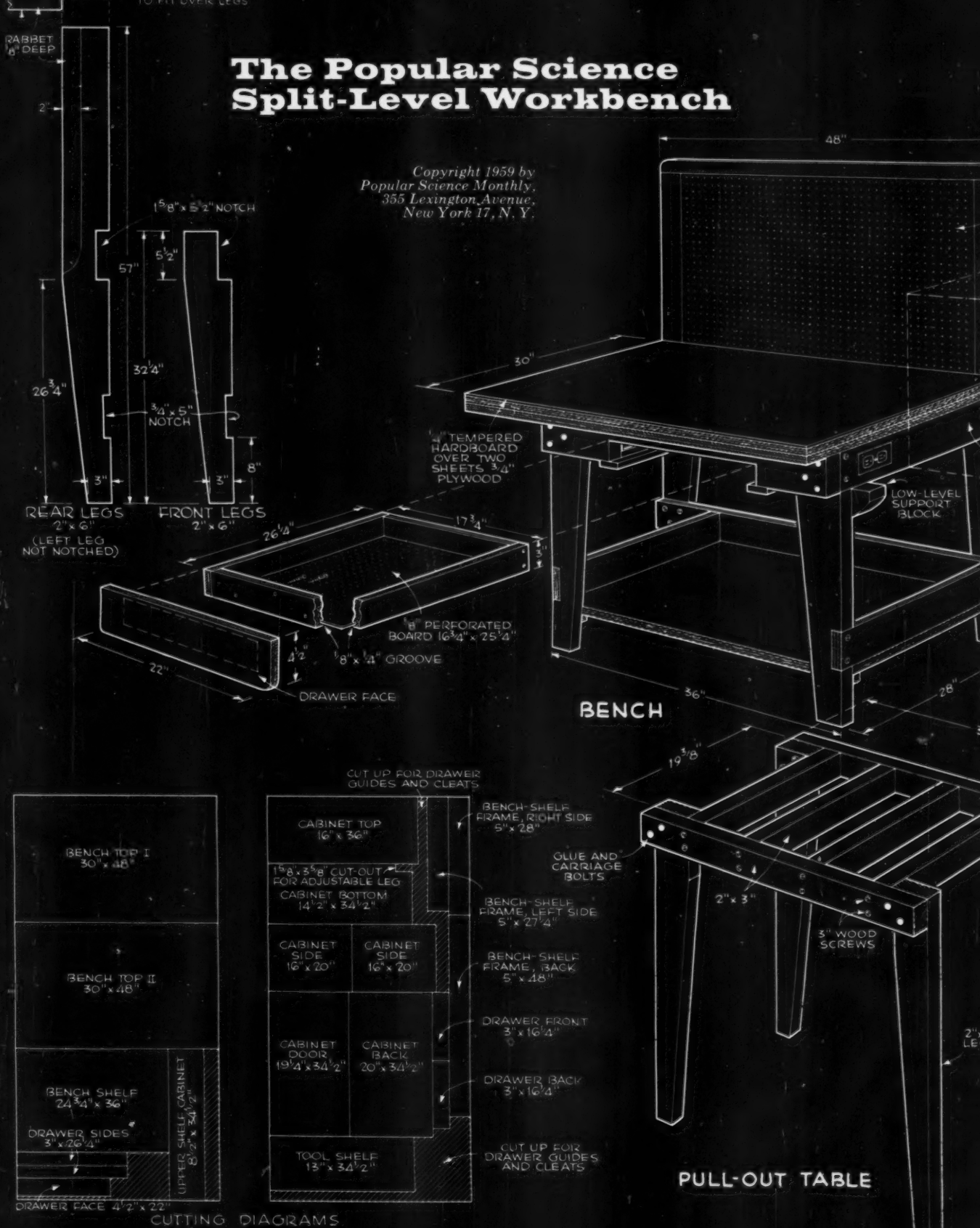
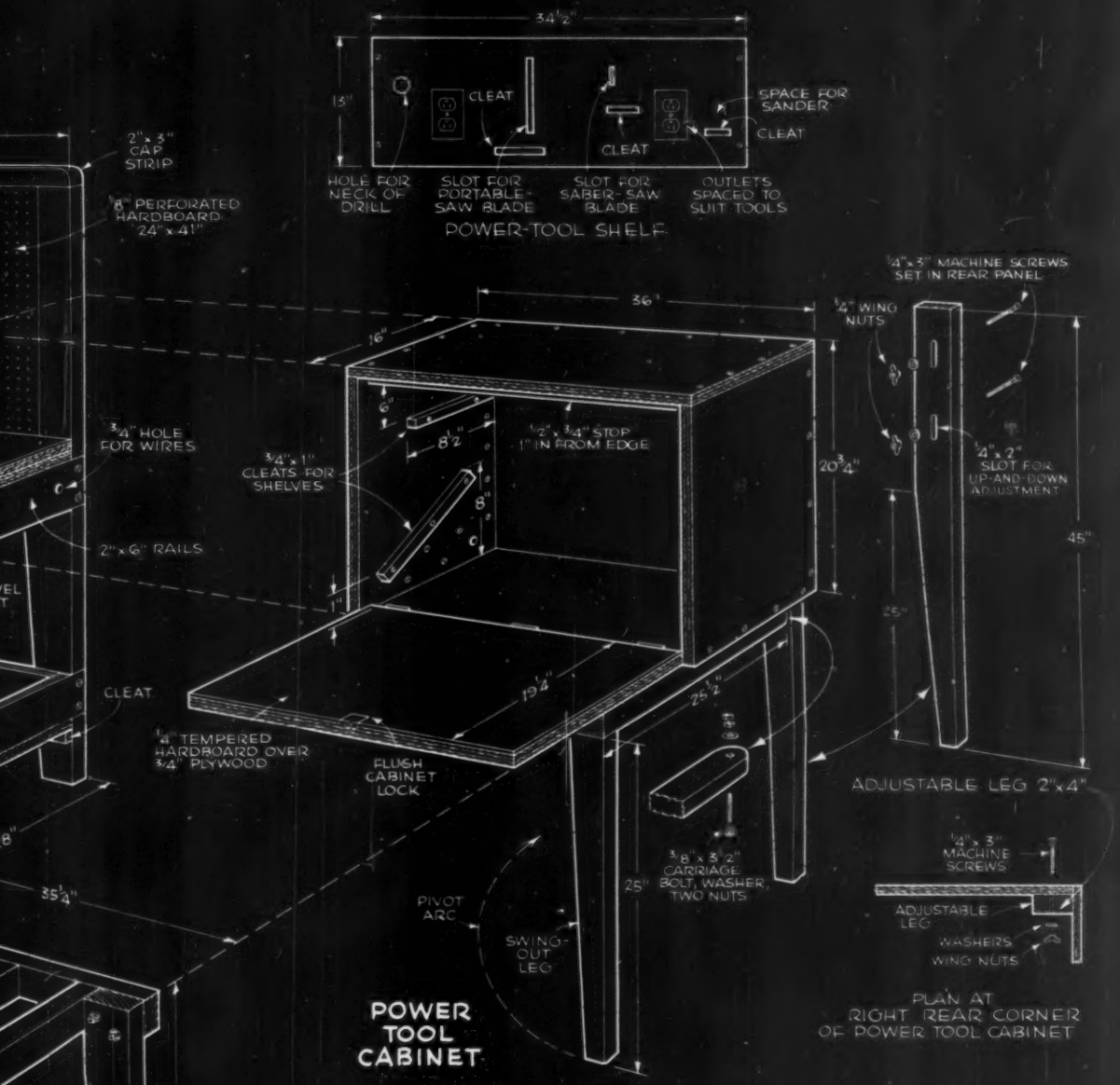




The Materials You Need

¾" fir plywood—(two 4'x8' panels)		
2 pcs	30"x48"	bench top
1 pc	24¾"x36"	bench shelf
1 pc	5"x28"	bench-shelf frame, right side
1 pc	5"x27¼"	bench-shelf frame, left side
1 pc	5"x48"	bench-shelf frame, back
2 pcs	3"x26¼"	drawer sides
2 pcs	3"x16¼"	drawer front and back
1 pc	4½"x22"	drawer face
1 pc	16"x36"	tool-cabinet top
1 pc	14½"x34½"	tool-cabinet bottom
2 pcs	16"x20"	tool-cabinet sides
1 pc	20"x34½"	tool-cabinet back
1 pc	19¼"x34½"	tool-cabinet door
1 pc	13"x34½"	tool-cabinet tool shelf
1 pc	8½"x34½"	tool-cabinet upper shelf

2"x6" lumber		
1 pc	36"	bench front rail
1 pc	24¾"	bench left rail
1 pc	28"	bench right rail
1 pc	48"	bench rear rail
2 pcs	57"	bench rear legs
2 pcs	32¼"	bench front legs
2"x4" lumber		
4 pcs	26"	pull-out table legs
1 pc	25"	pivot leg, tool cabinet
1 pc	25½"	top of pivot leg, tool cabinet
1 pc	45"	adjustable leg, tool cabinet
2"x3" lumber		
2 pcs	35¼"	pull-out table rails
4 pcs	19⅜"	pull-out table crosspieces
1 pc	48"	cap strip

¼" tempered hardboard		
1 pc	30"x48"	bench top
1 pc	19¼"x34½"	inside cabinet door
⅛" perforated hardboard		
1 pc	24"x41"	bench tool board
1 pc	16¼"x25¼"	drawer bottom
hardware		
8	3"	butt hinges with ¾" screws
1		flush cabinet lock
15	⅜"x3½"	carriage bolts
45	3" #14	flathead wood screws
100	1½" #8	flathead wood screws
25	1" #8	flathead wood screws
2	¼"-20x3"	machine screws, 2 washers, 2 wing nuts

electrical	
6'	3-wire #14 BX cable
10'	3-wire #14 rubber-covered line cord
1	3-prong plug for line cord
1	flush-mount junction box
3	recessed receptacle boxes
3	duplex outlets for 3-prong tool plugs
3	outlet plates
3	splicing nuts
2	BX connectors for junction-box holes
1	rubber-wire connector for junction-box hole

miscellaneous

sandpaper
glue
shellac

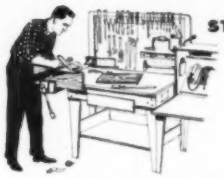
Assembly Highlights

1 THE ACCURACY OF THE BENCH can depend on the pains you take in squaring and assembling the front legs. Clamp parts while drilling holes for 3/8" carriage bolts, and join with glue for maximum rigidity.

2 A HAND BRACE fitted with a screwdriver bit makes easy work of driving the husky 3"-14 wood screws that hold the frame together. Cut the outlet-box hole in the side rail before assembling.

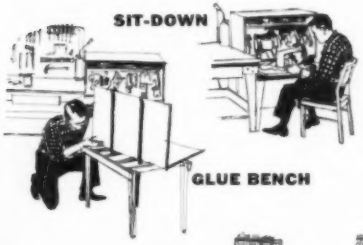
3 BUILD THE PULL-OUT TABLE EARLY—even before the bench—so you can put it to work as a sawhorse for cutting lumber and plywood panels. It will also be useful as an assembly table for the tool cabinet.

4 WHEN CUTTING PLYWOOD, don't worry about nicking the top of the pull-out table's rails. Like a butcher's block, they can be planed smooth after many saw kerfs chew up their surfaces.



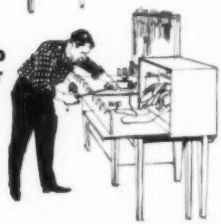
STAND-UP

How to Build the POPULAR SCIENCE Split-Level Workbench

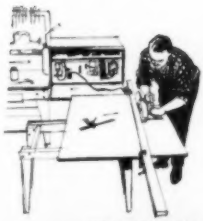


SIT-DOWN

GLUE BENCH

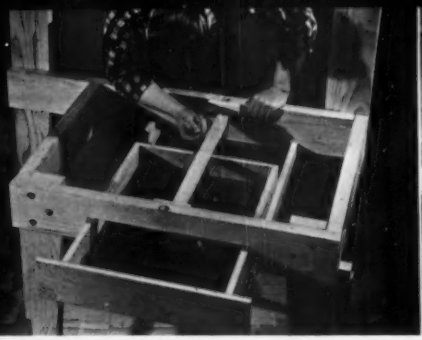


OUTBOARD SUPPORT



BIG PANELS

SAWHORSE



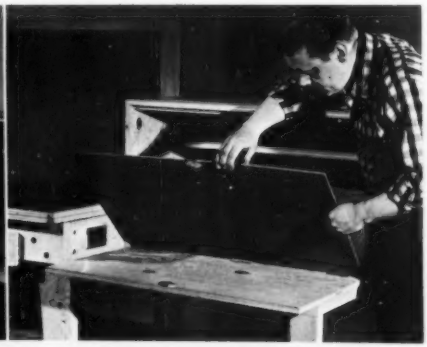
5 USE THE DRAWER to space the drawer guides and set them parallel. Wood strip in center above drawer is to keep front from dropping as it is pulled out beyond its balance point. Wax guides with a candle stub.

6 CABINET HAS TWO TRICK LEGS: an adjustable one (shown) that supports the outboard end on an uneven floor and a pivoting leg that swings out to support the door when used as a low-level sit-down bench.

7 WHILE THE BENCH FRAME IS OPEN, install the junction box and wiring; you'll have to do the job on your knees if you leave it until the bench is completed. Use splicing nuts to connect the wires inside the box.

8 LOCATE THE OUTLET BOXES, tool-blade slots and hole for neck of drill in positions best suited to your tools. The blades and portable-saw guard fit into the slots so tools can stand flat on their sole plates.

9 TIP: screw down the bench top before you install the tool board in its frame, so you'll have room to swing the brace without ratcheting it a half turn at a time to drive the screws into the rear bench rail.



10 THE HARDBOARD WORK SURFACES can be screwed in place with edges slightly overlapping the plywood, then planed or sanded flush. Don't sand the surface of the hardboard; sanding makes it fuzzy.

Copyright 1959 by Popular Science Monthly, 35

YOU don't have to complete this bench before you can begin using it. If you build the accessory pull-out table first, it can serve as a sawhorse and assembly table for building the bench itself.

The pull-out table is a simple affair: 2″-by-4″ legs tapered and fastened to 2″-by-3″ rails with carriage bolts and glue. Four 2″-by-3″ cross members are screwed between the rails to form an open top. You'll find this grid far more useful than a solid top.

Using the table and your portable saw, cut the bench legs and rails to size from clear 2″-by-6″ lumber. Cut the drawer opening in the front rail, the outlet-box opening in the right-side rail. Notch the legs as indicated.

Assemble the two front legs to the front rail with glue and ⅜″-by-3½″ carriage bolts to make a rigid subassembly that will help align other parts.

Screw the rear legs to the side and rear rails, then screw these to the front assembly to complete the frame. Use your square often to check alignment. Screw the lower-level support block in place behind the front right leg.

Next, cut each plywood panel according to the cutting plans. Here is where the pull-out table proves its worth. Place the panel on it and rest the overhanging end on the low-level support block protruding from the workbench. Clamp a 1″-by-3″ strip on the panel to serve as a guide for each cut made with the portable saw. While you're set up for panel cutting, cut the hardboard and perforated hardboard.

Assemble the drawer and install the drawer guides before putting on the bench top. It's easier now than working from beneath later.

Join the simple butt joints for the tool cabinet with screws and glue. If no clamps are available, driving the screws down firmly will pull the joints together, usually tightly enough to cause the glue to squeeze out as it should.

Fasten the cabinet to the end of the bench with screws driven through its left side into the right rail and edge of the right rear bench leg. Insert the adjustable leg in the hole provided in the cabinet bottom. Adjust it to bear firmly on the floor and lock it in position.

Drill a ⅜″ hole in the bottom of the cabinet for the pivoting, swing-out leg. Use two nuts and one washer to hold the leg on the bolt, tightening the nuts against each other to hold the leg snug, yet permitting it to pivot easily. Unless the floor is very irregular, the swing-out leg should be just the right height to support the cabinet door when in use as the low-level bench. If the leg is short, permanent shims can be added after the bench is set up for operation.

Hang the cabinet door on 3″ butt hinges set flush in the plywood. Install the door stop and cabinet lock, and chisel a groove in the cabinet top for the lock bolt.

Cut the tool shelf and saw the openings for its two outlet boxes. Install the wiring in both bench and cabinet. Use rubber-covered, three-wire cord to connect the bench to the nearest wall outlet. Run three-wire BX cable from the junction box at the rear of the bench to outlets in the cabinet and on the side rail. Join the wires at the junction box with plastic wire-splicing nuts. Screw the tool shelf and upper accessory shelf to ¾″-by-1″ cleats fastened to the cabinet sides.

Screw the three sides of the lower storage shelf to the bench legs. Lay the bench on its back and screw the shelf to the bottom edge of the sides, adding a small cleat beneath it at each leg if heavy objects are to be stored.

Permanently join the two 30″-by-48″ plywood panels for the bench top by spreading them with glue and pulling them together with 1½″-8 screws. Drive 3″-14 screws through the top into the rails to fasten the top in place. Screw the hardboard work surface over it and sand edges flush.

Cut the hardboard surface for the cabinet door to fit snug around the lock, bevel the underside of its rear edge to clear the hinge butts and screw it in place on the inside of the door.

Slip the perforated tool board into the rabbets previously cut in the rear legs and cap, and screw it in place.

Sand the bench and cabinet smooth and finish with two coats of shellac or Satinlac.

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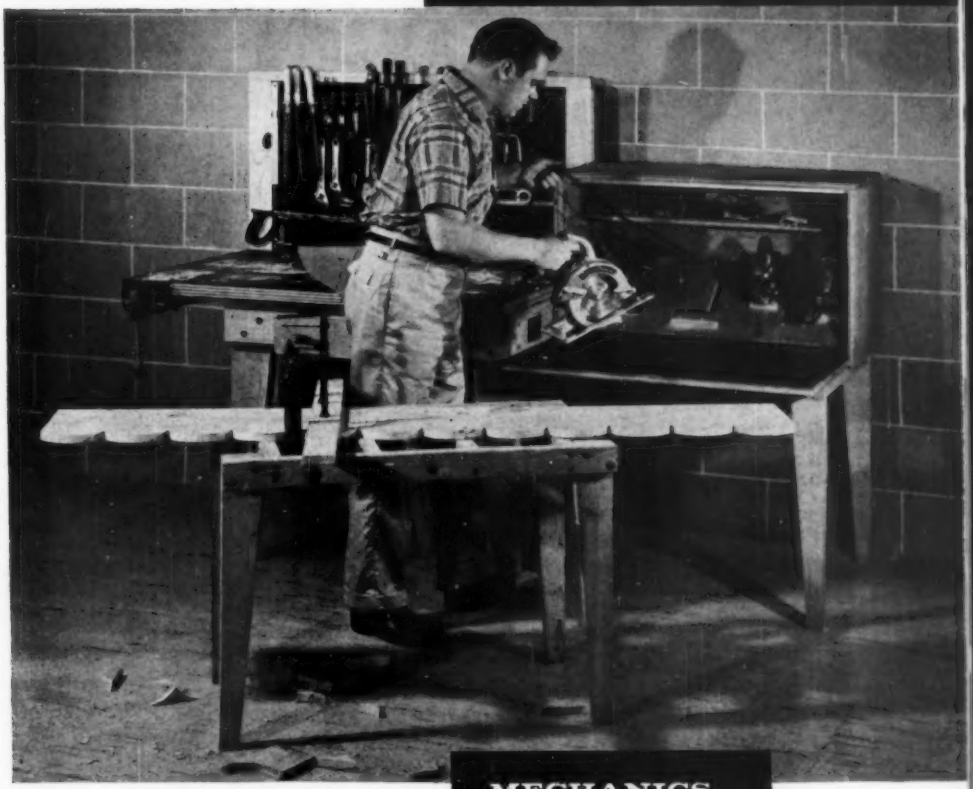


MECHANICS AND HANDICRAFT

Exciting New Split-Level Workbench

THE DAY you buy your first portable power tool something seems to happen to the time-honored workbench. You begin to find it inadequate.

Now you can have a bench designed expressly for portable tools. A split-level bench developed by POPULAR SCIENCE MONTHLY fills today's shop needs, and yet retains all merits of the traditional bench. It's a brand-new concept—with six major features:

- Live storage of portable power saws,

CONTINUED

Here's the end of fussing with tangled wires and tools stored in shipping cartons

THE POWER-TOOL COMPARTMENT provides safe, dry tool storage, well above the dampness level of most basement floors. All your tools are locked away with the turn of a single key (above). Don't underestimate the convenience of having the tools always plugged in and ready for instant use. You just reach for the tool you want, and use it for the job at hand.

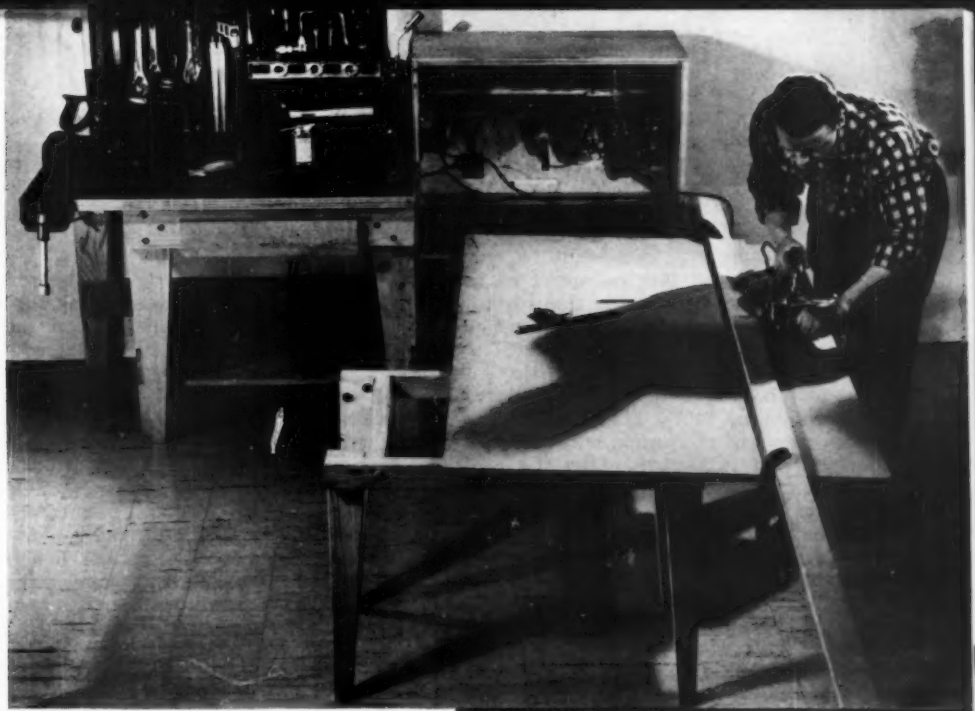
drills, sanders—all plugged in ready for use.

- A locked compartment to keep tools safe from children and borrowers.
- A four-foot bench at conventional height for stand-up work.
- A bench nearly three feet wide at a lower level for jobs you do seated.
- A pull-out table with many special uses.
- Outboard support for long pieces.

Built with a fresh eye for what a man using modern tools needs in today's home shop, the new bench still has everything necessary for working with conventional hand tools. These are kept handy on a perforated-hardboard backboard at the rear of the main bench. At a height of 34″, the upper bench satisfies all normal hand-tool needs.

But why stand when you can sit? The door of the tool compartment hinges down to provide a low-level work surface. Sitting there, you can carry out many electrical jobs and home repairs much more comfortably.

Actually, greater convenience in working with all of the handy portable power tools was the big reason for dropping part of the work area to a lower level.



FULL-SIZE PANELS of plywood or other sheet material are no longer a problem to handle and cut. How would you make this rip cut on an ordinary old-fashioned workbench?

In shop operations today, as often as not you find yourself confronted by large panels of plywood or other sheet material, convenient to buy but awkward to handle and cut up. The split-level workbench overcomes this.

The pull-out table does the trick. You pull out the accessory table, swing the pivoting leg into position under the low-level bench and you're in business. Rest the plywood panel on the table and bench and it's at a convenient height for working with power tools drawn from the storage compartment.

Inside cuts over the open-top table are well supported, instead of hanging in mid-air as they would if the panel were straddling two sawhorses. There's less risk of splintering on cut-offs, and a saber-saw blade can cut freely in the spaces between the grid rails.

If you should nick the table top when cutting through a panel, there's no harm

The pull-out table nests out of the way when not in use. But it seldom stands idle

THE OPEN TOP of the pull-out table lets you place clamps where you want them. No more sliding work to an off-balance position, over the bench-top's edge, to install the clamps.

TABLE DOES THE WORK OF TWO SAWHORSES. Note, in the background, the pivoting leg is in the out position, ready to support the swing-out tool-cabinet door.

CONTINUED

done. Like a butcher's block, the rails and cross members can be planed smooth after many saw kerfs chew up their top surfaces.

The tool cords also reach from the tool-shelf outlets to the far end of the high-level bench if you want to work there. Extra cord lengths aren't in the way; they tuck behind the slanting tool board. Three-wire circuitry keeps all electric tools grounded.

It's a gluing table, too. The little table was patterned after the old-time cabinetmaker's gluing table. The open top provides free use of clamps without interference and without hanging the work over the edge. The table also makes an effective broad-topped sawhorse, and it's low enough to hold a board with your knee while you handsaw in true carpenter's style.

Even the drawer has a new idea. It has a perforated-hardboard bottom that clears itself of the sawdust and small chips that find their way into a bench drawer. Each time you open and close the drawer, the dust is agitated and falls through the perforations.

Construction of the bench is as modern as its design. Instead of the usual bench top, made by edge-butting two-by-sixes together and tediously planing them smooth, both levels of the split-level bench are made of ¾″ plywood covered with a replaceable work surface of ¼″ tempered hardboard. The high-level bench top is actually two layers of ¾″ plywood glued and screwed together to gain the solidity needed in a woodworker's bench. You'll find it's got that armor-plate rigidity so desirable when you're working with chisels and gouges.

The bench top overhangs the sturdy frame 2″ along the front edge for clamping work to the bench, and 12″ at the left side to allow room for the vise. (Note how the left legs are staggered at front and rear.) The low-level bench protrudes 3″ further out than the higher level, to support long work held in the vise.

Maximum strength and rigidity are built in with a minimum of materials. All the plywood you need can be cut from two 4′-by-8′ panels. Skin strength of the perforated tool board holds the bench frame square and prevents sidesway without the use of diagonal bracing. The lower storage shelf with its three sides also adds to the overall rigidity. There's no need to lag-screw it to the walls to make it stand firm.

The plywood tool cabinet is permanently fastened to the side of the main bench. An adjustable leg at the rear of its outer end can be moved up or down and locked to conform to an uneven floor.

A final tip: If you already own a good conventional bench, consider building the tool cabinet and pull-out table only. You'll then be right up-to-date.

Split-level isn't just a catch-phrase; it's practical

THE LOW-LEVEL WORK SURFACE is useful even when not actually being used. Here its protruding edge conveniently supports the end of a long job held in the workbench vise.

TINKER IN COMFORT seated at the low-level bench. An outlet in the right side of the main bench is convenient for such things as soldering or using a hand grinder on small work.

Short Cuts and Tips

FROM PS READERS

Child-Size Rod for Clothes Closet

HERE'S a clothes-rod adapter you can make so that small children can hang their clothing in a closet without trouble. It is attached to the regular rod by screwed blocks that are easy to install and can be removed without damage to the original rod when the children grow up.

Drill side braces for a snug fit on the upper rod. Then saw out a corner through each hole. Fit the pieces to the rod and screw the cutouts back.—*D. E. Roetman, Dayton, Ohio.*

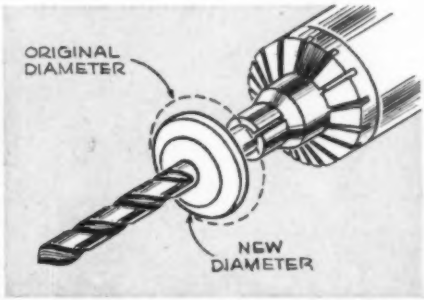
▶▶▶REMNANTS of soap bars in the feet of two nylon stockings make a handy soap bag for use in the shop. Pull one stocking over the other and close with a knot. The nylon takes grease off your hands easily. —*W. F. Biles, St. Petersburg, Fla.*

▶▶▶WHEN my husband tried to rid our yard of poison ivy last year, he got a severe case right through his gloves. This year he covered his hands and shoes with plastic vegetable bags. Result: no itching. —*Mrs. Monty Koslover, Reading, Mass.*

Protecting Soldering-Gun Bulb

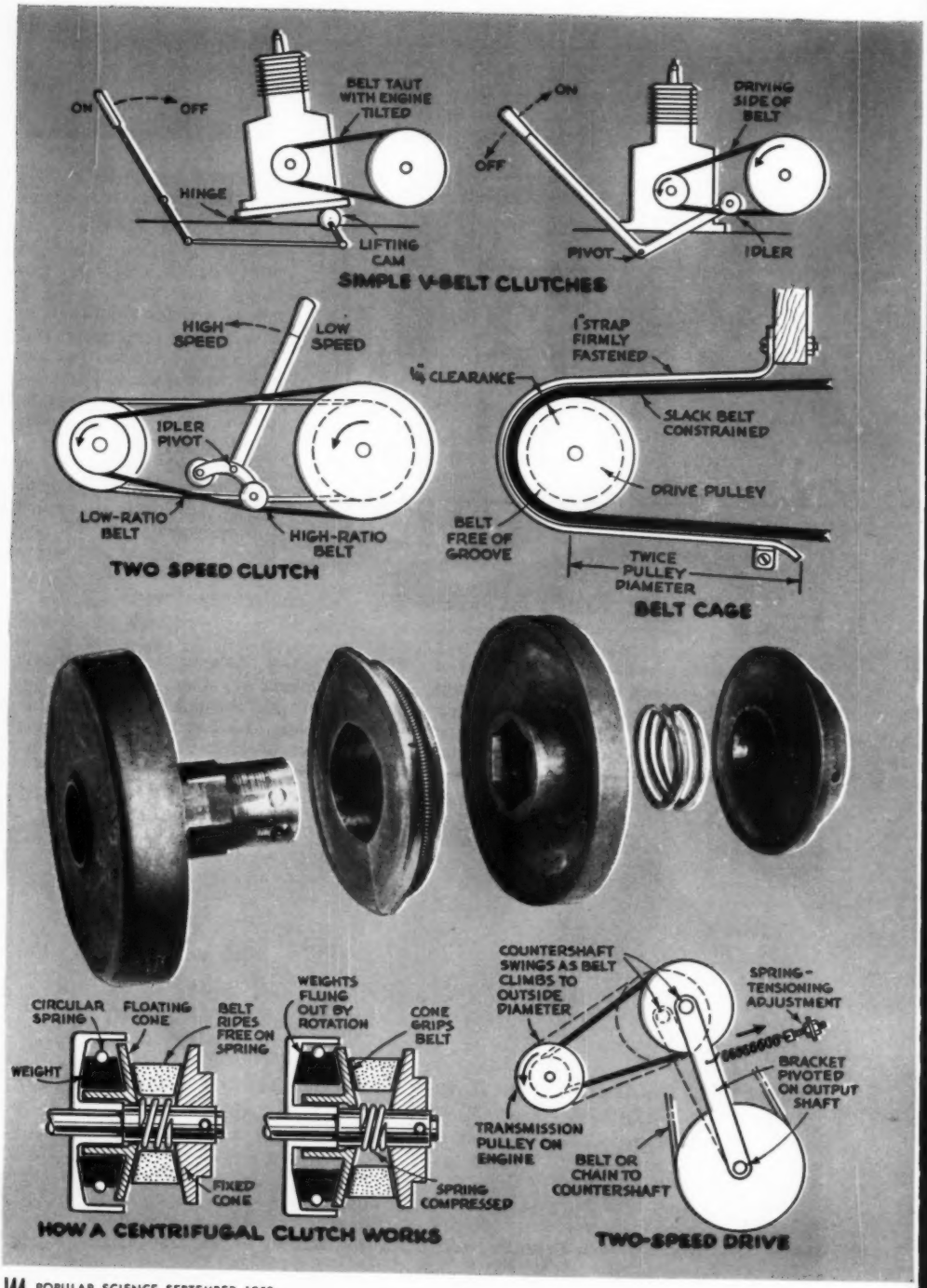
A SPOTLIGHT soldering gun can present a problem if you keep it in your toolbox with other tools. Ever try to remove the remains of a broken bulb?

You won't need to if you pad it with a 1"-by-2" piece of foam rubber or plastic sponge held in place with a rubber band. —*John A. Comstock, Wellsboro, Pa.*



Reducing Size of Faucet Washer

CAUGHT in an emergency when I needed a small faucet washer and had only large washers on hand, I cut down the size of one this way. I pressed it tightly on the shank of a bit, which I chucked in the drill and used as a mandrel, dressing the washer to size with coarse sandpaper.—*John Chase Reed, Cincinnati.*


ON
OFF
BELT TAUT WITH ENGINE TILTED
HINGE
LIFTING CAM
SIMPLE V-BELT CLUTCHES
ON
OFF
DRIVING SIDE OF BELT
PIVOT
IDLER
HIGH SPEED
LOW SPEED
IDLER PIVOT
LOW-RATIO BELT
HIGH-RATIO BELT
TWO SPEED CLUTCH
1" STRAP FIRMLY FASTENED
1/4" CLEARANCE
SLACK BELT CONSTRAINED
DRIVE PULLEY
BELT FREE OF GROOVE
TWICE PULLEY DIAMETER
BELT CAGE
CIRCULAR SPRING
FLOATING CONE
BELT RIDES FREE ON SPRING
WEIGHT
FIXED CONE
WEIGHTS FLUNG OUT BY ROTATION
CONE GRIPS BELT
SPRING COMPRESSED
HOW A CENTRIFUGAL CLUTCH WORKS
COUNTERSHAFT SWINGS AS BELT CLIMBS TO OUTSIDE DIAMETER
SPRING-TENSIONING ADJUSTMENT
BRACKET PIVOTED ON OUTPUT SHAFT
TRANSMISSION PULLEY ON ENGINE
BELT OR CHAIN TO COUNTERSHAFT
TWO-SPEED DRIVE

What you can do with

Those Amazing New Clutches for V-Belt Drives

By Howard McEntee and Harry Walton

AN ENGINE pulley can do much more these days than circulate a V belt. There are some gadgets around that work wonders in transmitting V-belted power from gas engines and electric motors. You see them more and more on power mowers, riding tractors, one-lung cars and power tools. They can:

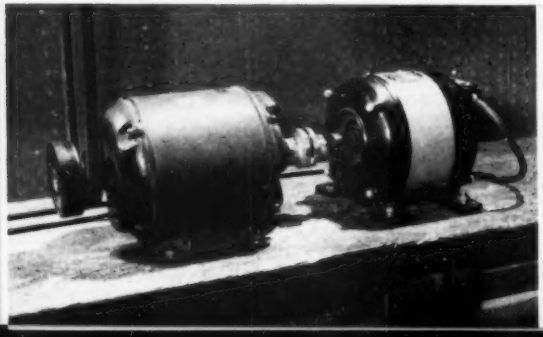
- Let a gas engine start without load, but take hold the moment it is revved up.
- Practically eliminate stalling.
- Shift drive ratio to suit loads.
- Let *you* change the ratio, and therefore the torque and speed.
- Act as a gearless, highly effective differential on small vehicles.
- Bring AC motors up to speed without laboring or blowing fuses.

It's the modern V belt, a slick trick itself, that makes most of these devices possible. The commonest of them are automatic clutches. Controlled by the throttle alone, these clever devices engage as soon as the engine or motor gets going fast enough to shoulder the load.

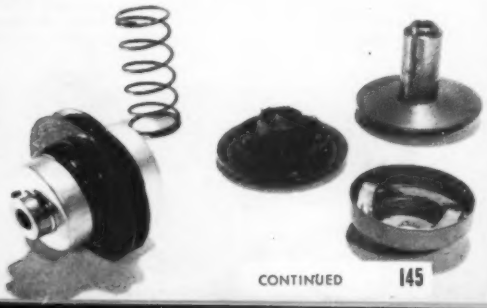
A clutch is a must with a gas engine for easy starting and control. Although frisky little cars have had the engine directly coupled to the wheels, it's hardly ideal to push the car to start it, and hop on as it takes off.

You can of course rig a nonautomatic

TWO VARIABLE PULLEYS are better than one if a large ratio change is wanted. These are both on a countershaft, adjustable between power source and driven unit. Moving countershaft simultaneously shifts one belt to a bigger, the other to smaller diameter. For maximum ratio change, both pulleys should be the spring-loaded kind; for maximum torque, both the cam-follower type. Two types are shown below.



A PAIR OF CHEAP QUARTER-HORSE MOTORS of the same speed rating can be teamed up with a flexible coupling to pull loads that otherwise would require a big, more costly motor. If the belt is driven by an automatic clutch, one motor can even be a junked one with a burned-out and disconnected starting winding, only the running winding being powered. The other motor starts both before the clutch engages.



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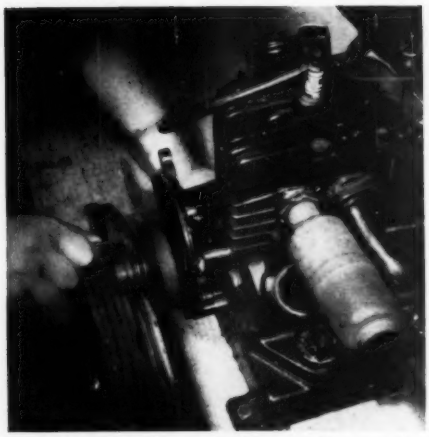
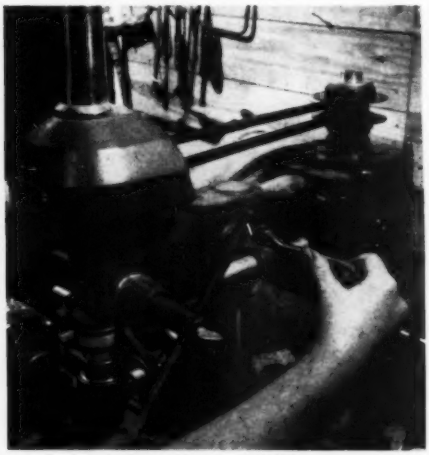


SIMPLEST DRIVE for a one-lung car, from engine to a 7" wheel pulley, is possible because of smooth takeup of centrifugal clutch. It gives high speed, but wears the belt rapidly on starts. A two-step 1:9 ratio would be better.



QUICK SPEED CHANGES on a drill press are made with a spring-loaded variable pulley on the motor, which is shifted by hand to alter ratio. A screw or lever shift could be fitted.

INTERNAL-SHOE CLUTCHES use circular spring, like a garter, that holds in friction shoes. At speed, centrifugal force overcomes spring and shoes move out to press against drum. Some clutches have shoes pivoted at the ends.

clutch on almost any V-belt drive. One way is to mount the engine on rails or a hinged base with about an inch of free movement to tighten a loose belt. The time-honored tensioning idler is also practical, though V-belt engineers shudder at it because it puts an extra bend—often a reverse curve—in the belt.

If you must use an idler, experts plead, have it *inside* the belt pushing outward, as near the larger pulley as feasible, and on the *slack* or nondriving side of the belt.

Where two drive ratios would be useful (in a midget car, for instance) the two-belt drive in the drawings is practical. Side-by-side belts run on pulleys providing the two desired ratios. The "shift" lever has an idler for each belt. Pulled one way it tightens the high-ratio belt; moved the other, it engages the low-ratio belt. Halfway between, it leaves both belts slack, so serving as a clutch.

A belt may drag even when loose because its tendency to assume a circular shape wedges it into the outside of the driving pulley. You can tame it by putting a cage around it. Made of stiff metal about an inch wide and shaped closely to the pulley curvature, the cage holds the belt away from the pulley, provides clean disengagement without belt wear or drag.

Automatic clutches eliminate manual controls. Centrifugal action engages them more smoothly than you could by hand, with less belt wear.

The more expensive ones have fixed sheaves or pulleys on which the belt is constantly at driving tension. In the shaft-fixed member are spring-loaded shoes lined with friction material. These fly outward under centrifugal force until they bear on the inner surface of the pulley member.

Some with shoes pivoted at one end work well only in one direction, but the shoes can be reversed for opposite rotation. Other clutches have weights that move tapered collars along the shaft axis to wedge with mating sockets. One has steel balls inside a garter spring, which in flying outward squeezes the belt sheave between two friction facings.

The belt is the clutch in a cheaper but very efficient type. One sheave flange floats axially on the clutch hub. Internal weights, flying outward as revs mount,

TIGHT TURNS are taken in stride by wheeled vehicle having a dual transmission unit. It requires two V belts and dual countershafts. The twin sheaves automatically shift to suit starting, running and hill-climbing loads. In turns, the one driving the inner wheel shifts down, the other up. The riding tractor shown at right, so equipped, can turn in its own length in either direction.

shove against a coned surface inside the sliding flange, moving it toward the fixed flange.

The V belt, which rides free on a wire collar at idling speed, is nudged up between the flanges and smoothly takes hold. A properly installed belt rarely needs adjusting, for the flanges always grip it just tightly enough to drive without slip.

Clutches for kilowatts. Split-phase electric motors, the cheapest and most common kind used to power large acces-

[*Continued on page 260*]

CLUTCH SUMMARY

Maker	Model	Price	Type	Size (Diameter)	Ratio (to 1)	Max. Hp.	Min. Hp.	R.P.M.	Notes
[illegible]	89002	$11.15	V	3 dia. 2 w.	1.38	2 Gas	2"		All metal
[illegible]	4600	10.45	C	5½ dia.		3 Gas	3"	1000	Pivoted shoes
[illegible]	135 manual	8.00	V	3½ dia. 3 w.	2.00	¼ Elec.	1.6"		Plastic sheave
	1 manual	13.50	V	8 x 6 x 5	3.3	⅓ Elec.		1150	Double-sided pulley
[illegible]	30 manual	7.25	V	3½ dia. 3 w.	2.00	½ Elec.	1.5"	1750	Locking type
[illegible]	Ex-10-25	5.50	C	3 dia. 2 w.		¼ Elec.	2½"	1800	
	4517-18	12.50	C	4 dia. 2 w.		2 Gas	12T	1800R	12-tooth sprocket
[illegible]	MD58	13.95	C	5½ dia. 2¼ w.		3½ Gas	3"		Pivoted shoes
[illegible]	300	57.50	CV	12 x 6 x 5	4½	3 Gas		1200R	Two pulleys, special belt
	G5A-10	11.00	C	3½ dia. 3 w.		2½ Gas	2¼"	1500R	
	E5A-10	11.00	C	3½ dia. 3 w.		⅓ Elec.	2¼"	1750	
[illegible]	18C4A2	5.95	C	3 dia. 2 w.		1½ Gas	2"	1800	All metal
	18T5A25	8.95	CV	3½ dia. 2 w.	1.6	1½ Gas	2"	1800	All metal
	18D5A25	17.95	CV	3½ dia. 4 w.	1.6	2 Gas	2"	1800	Acts as differential

[illegible] Clutch only. V: variable ratio only. Max's are specified maximum or engagement speed. [illegible] Above listing is not complete, but is offered only as representative. Units listed are in most cases smallest of each type made by the manufacturer named. Most can be had with different shaft-bore sizes. Almost identical types, made for gas engines or electric motors, differ chiefly in engagement speed, which is usually lower for electric motors.

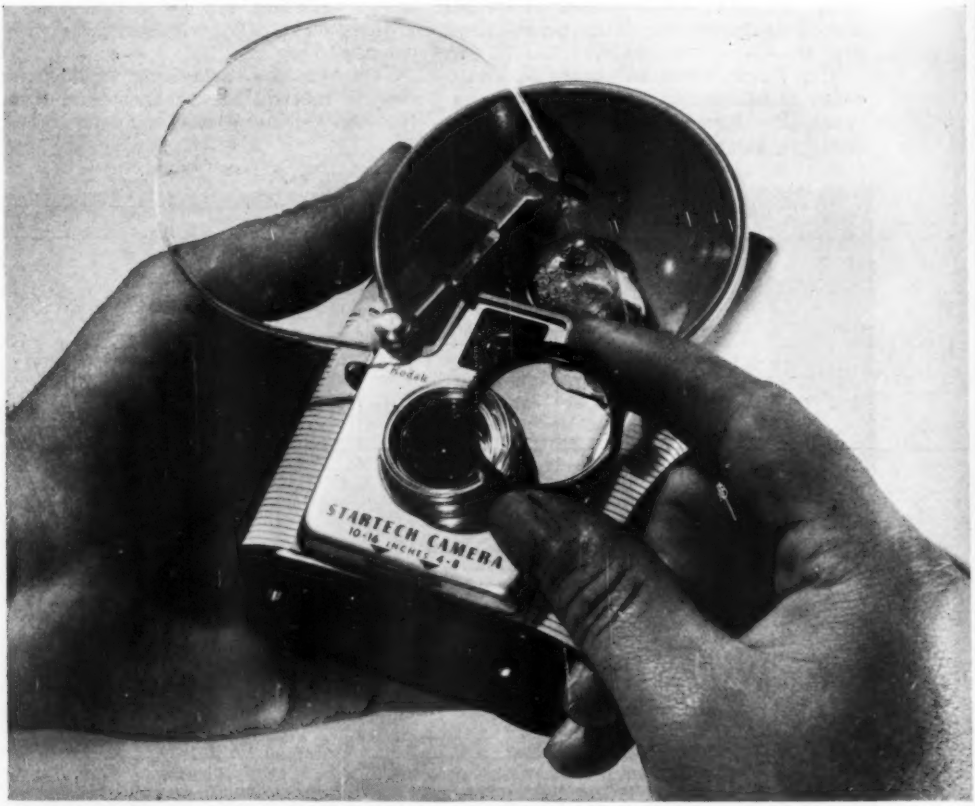
The Camera That's Made for

A TINY new camera designed to let dentists take pictures inside people's mouths is selling like hot cakes—to hobbyists, home craftsmen, stamp collectors, model builders and nature lovers.

The reason for its surprising uses is its remarkable ability to take jumbo-size close-ups as little as 4″ away from a subject. You can make lifelike portraits of miniature models; full-color blow-ups of flowers, birds and insects; copy plans; or record details of a shop project.

The secret is a super-small lens opening—f/64—that works something like the old pinhole camera. It produces a depth of field so great that you can guess at the distance, be several inches off and still get clear, sharp pictures.

Called the Startech, the new camera is a modified version of Kodak's inexpensive Brownie Starflash. It has the same box-camera simplicity. You can't miss. To shoot at 4″ to 8″, you move a pointer to a red arrow, slip on a matching red close-up lens and click the shutter. Light from a built-in flash provides correct exposure indoors or out.

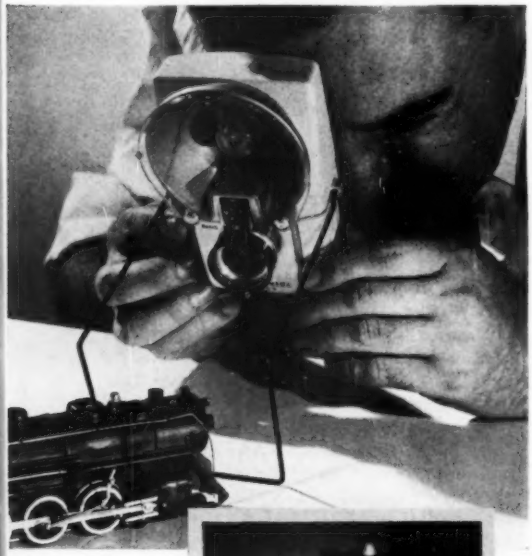


SPECIAL COLOR-CODED LENSES slip over regular lens to adjust focus down to 4″. Distance indicator at bottom of camera is the only setting you make. Moving it to either red or green arrow shows whether to use matching red or green lens. Wedge-shaped prism at bottom of plastic flash shield swings in front of viewfinder to correct for parallax at close range.

Close-Ups

For shooting at 10″ to 16″, a second setting opens up the lens to f/27. You just move the pointer to green and slip on a green-coded lens. A parallax-correcting prism built into the plastic flash shield makes sure the viewfinder shows exactly what the lens sees.

The camera uses standard M-2 flashbulbs and 127 roll film. Panatomic-X is recommended for black-and-whites, Type F Ektachrome for color. A kit (camera, lenses, film, bulbs) sells for $34.75. Lester A. Dine Co., 58-06 37th Ave., Woodside, N.Y., is the distributor.



ACTUAL-SIZE PRINT made from 127 film shows close-up of tiny HO-gauge locomotive shot at 5″. For critical work, wire frame slips into the front of the camera to indicate exact distance.

Gauging Depth of Post Holes

If you mark your post-hole digger at half-foot intervals, it will save you time and steps. You can then tell at a glance how far down you've dug.—*Tom Raymond, Alamogordo, N. M.*

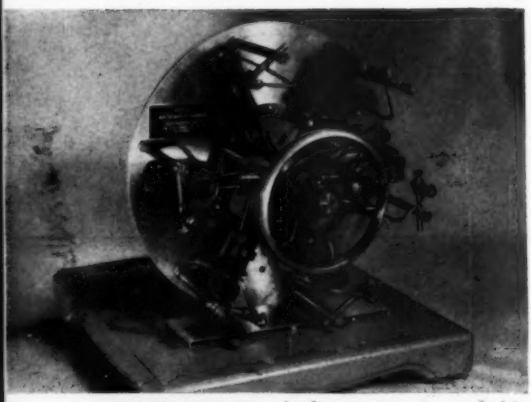
Clean Tongs Keep Prints Clean

Dirty print tongs often mar glossy photo prints. After you use a pair, it's a good idea to soak the tongs in one or two changes of clear water to remove developer residues that can cause the damaging marks.—*Hartwell J. Kennard, Gonzales, Tex.*

An Old-Time Engine That Refuses to Die

DESPITE atomic power and the space age, readers of POPULAR SCIENCE are as interested as ever in building piston engines. They still ask for plans for the mystery engine that appeared in February, 1950.

Published projects ordinarily live a year or two. But requests for copies of this one keep coming in, nearly 10 years later, and it's now out of print. At this point, plans are available only as a blueprint from the designer and builder of the original engine.*



CHAMP BUILDER of the engine is probably Waldemar Hansen, Los Angeles machinist. He made six one-lungers, two two-cylinder versions, and this six-cylinder giant. One cam works all valves. Five con rods go to a master rod. The flywheel is from a sewing machine.

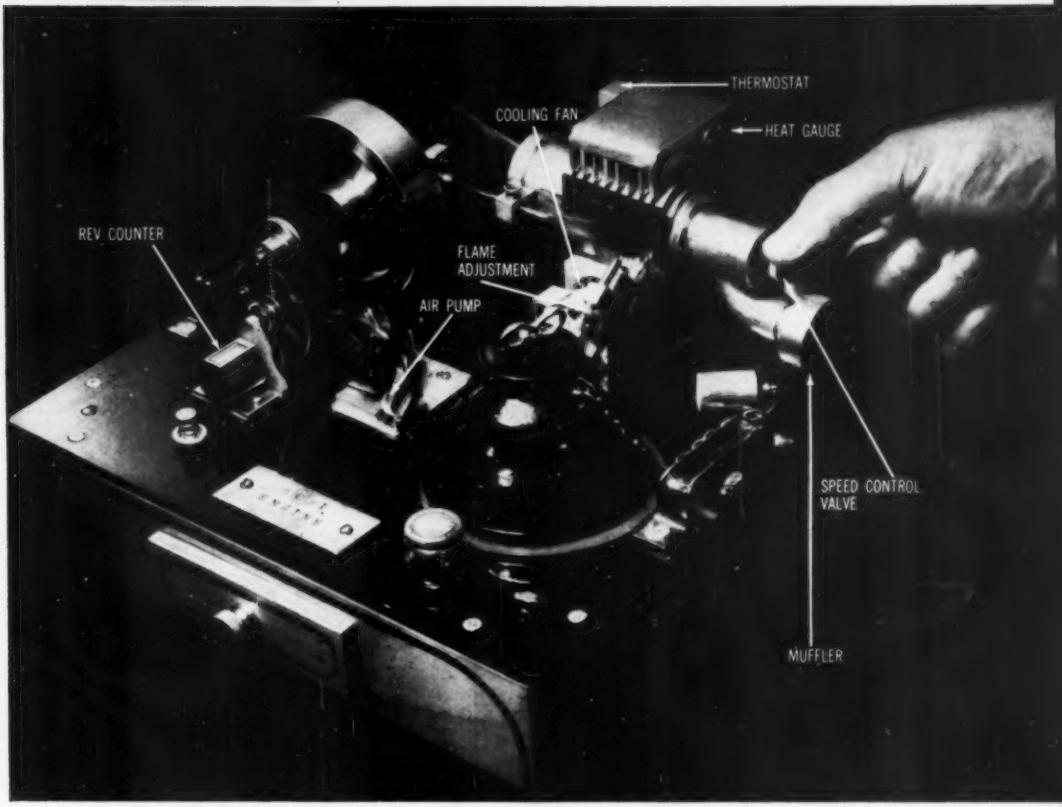
A real old-timer, though updated with modern materials, the engine works like the very earliest piston engines. These used steam or the explosion of gas or coal dust, chiefly to fill the cylinder on the piston's outstroke. As the steam condensed or hot gases cooled, a partial vacuum formed. Atmospheric pressure then pushed the piston in.

It's fun to run, for the engine has a machine-gun exhaust and is powerful enough to drive light models. More than 420 sets of castings have been sold, and countless other engines have been built from stock, pipe fittings and scrap. One man made six for his grandchildren. Another grouped six cylinders into a large radial engine (at left).

Colleges and vocational schools use the castings to train student machinists. Construction requires only a lathe and a drill press, but gives practice in many machining techniques.

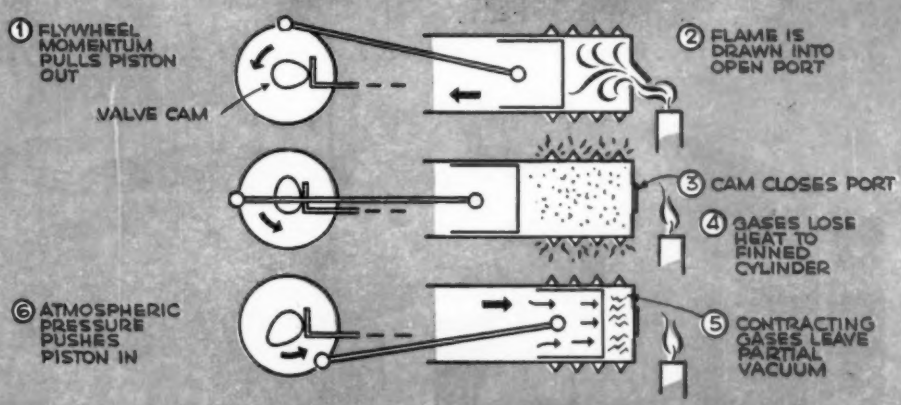
The super-gadgeted version shown on the facing page has a honed hard-chrome bore, an aluminum piston with colloidal graphite baked on, a muffler, thermostatic cooling, and an adjustable valve that controls speed from 175 to 1,000 r.p.m.

**Floyd McGuckin, 314 No. Monroe St., Ridgewood, N. J. Blueprint $1. Castings, all needed stock, and blueprint, $8.75 postpaid.*



ENGINE WITH EXTRAS. Built from stock by James M. McKinney of Englewood, N.J., this one has ball bearings, automatic electric cooling, a rev counter, temperature gauge and other extras. It drives a tiny air pump. Base holds tools and batteries for the fan motor.

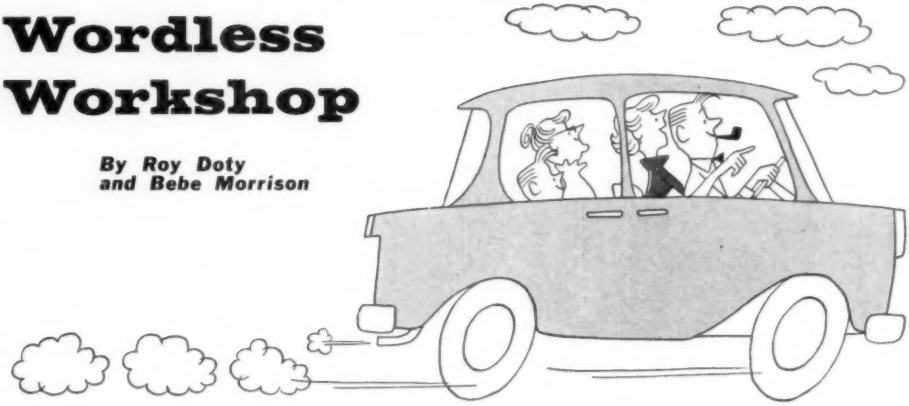
Solution to the mystery of how the engine works

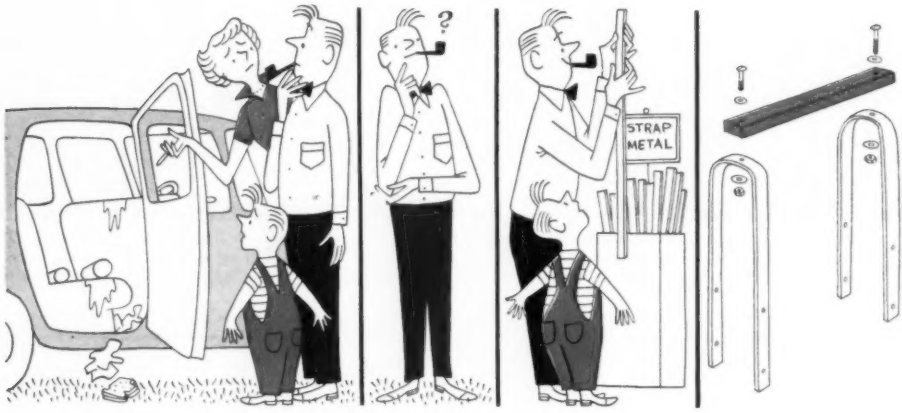


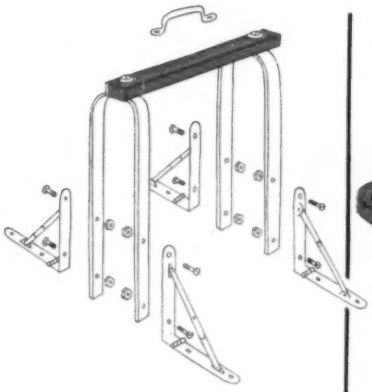
A FLAME BURNS OUTSIDE the port, here shown at the end of the cylinder for clarity. At 1,200 r.p.m., the whole sequence shown occurs in 1/20th second. Exhaust pop results as the piston forces residual gases past the spring-loaded valve at the end of its instroke.

Wordless Workshop

By Roy Doty
and Bebe Morrison

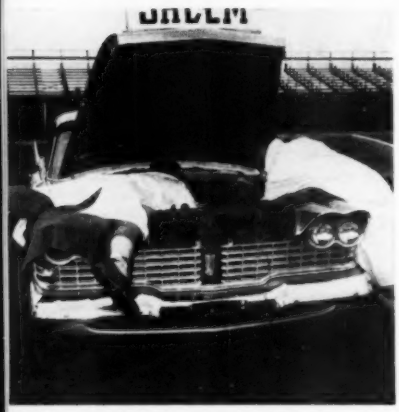






DOTY

Can You Beat These High School Mechanics?



Laying into the job. *Months of training have taught boys that nimble fingers and an understanding eye are faster than the most elaborate test equipment.*

By Hubert Luckett

TWENTY shiny new Plymouths are facing the grandstand. Not one of the engines will start. Twenty Plymouth service managers are each nursing a box of spare parts. Twenty teams of high-school mechanics are racing to correct some 12 to 20 "bugs" put into the cars by the service managers, now the judges in this new kind of interscholastic competition.

The winners will be the first team to correct all the troubles and drive their car across the finish line.

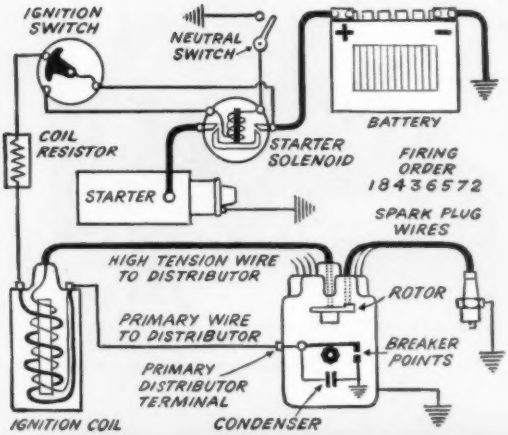
Plymouth sponsors these contests in various parts of the country in cooperation with local school officials. Each school is represented by a two-man team chosen from among the top students in vocational auto-mechanics courses.

Like to match your mechanical know-how with the

YOU can match your trouble-shooting skill with the high-school students who, in 22 minutes, found and corrected 19 malfunctions similar to those in the following quiz. Most of the troubles simulate those you might have in your own car if it conked out on the highway, was running poorly, or wouldn't start in the morning. Some could be caused only by a practical joker.

In the actual contest, all 19 malfunctions were present when the contestants started to work. As described here, a single malfunction is responsible for each complaint. Tests given are the sort used by the students to trace the troubles rapidly. Deductions that can be made from the results of these tests will narrow the possible causes to the one most likely trouble.

Following are 10 problems, and your preliminary diagnostic steps. What would you do or diagnose next? You're on your own, so think hard before hurrying to page 244 for the answers.



SIMPLIFIED ELECTRICAL CIRCUIT of a typical engine shows the parts involved in the tests. Information gained from each test will be more apparent if you trace through the circuit while you are reading the description.

prize-winning contestants? Here are 10 challenges

1 ***Your engine is hard to start; it misses at low speed; acceleration is poor; it runs fairly well at high speed.***

You remove the air cleaner and check the carburetor. Choke operation is okay. You can see that fuel is reaching the carburetor when you work the accelerator pump. Next, you check the spark at the plugs with the engine idling. You find the spark is weak and erratic. You stop the engine, remove the distributor cap and remove the coil high-tension wire from the cap. With the switch on, and holding the tip of the high-tension wire near a clean spot on the block, you flick the breaker points with your finger. There is a juicy spark to the block. Inspection of the rotor and cap reveals no flaws. What's wrong?

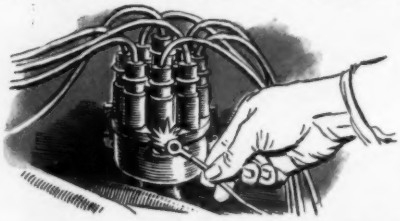
2 ***Your car won't start. The starter doesn't operate.***

You try your headlights. They don't burn. Using a short piece of insulated wire for a jumper, you hold one end on the positive battery terminal and rake the other end lightly across the negative terminal. You get a hot spark. You get no spark when you check from the positive terminal to ground.

CONTINUED

3 *Your starter operates vigorously but your engine won't start.*

You remove the wire from a spark plug and find there is no spark when the engine is turned over by the starter. You take off the distributor cap, remove the wire from the center tower, hold the tip of the wire close to a clean spot on the block and flick the points with your finger. No spark. You turn the engine over until the points are open and note that the gap looks about right. You remove

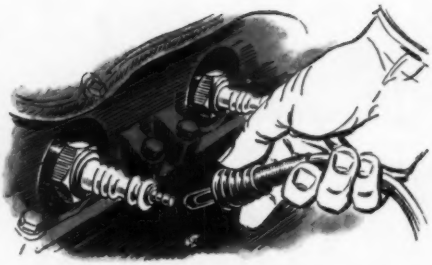


the primary wire from the distributor and touch it to the block. It sparks. It also sparks every time it is touched to the distributor terminal.

4 *Your engine starts and runs all right but dies abruptly when you take your foot off the accelerator.*

You remove the air cleaner and check to see if some joker has backed off your idle-speed adjustment screw. Its position looks about right. You can see that fuel reaches the carburetor when you pump the accelerator. There is a good spark at the plugs when the engine is cranked.

Taped air filter *was the meanest gimmick. Many contestants got the engine running only to find it wouldn't start again for the dash to the finish line.*



5 *Your starter operates normally but the engine shows no signs of life.*

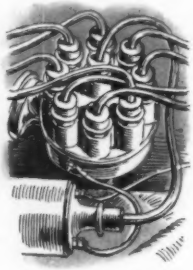
You pull a wire from a spark plug and find there is no spark when the engine is cranked. You try the coil high-tension wire and get a good spark to ground. The high-tension wire is making good contact at distributor cap, center brush in the cap makes good contact with the rotor. Cap is in good condition.

6 *Your engine starts, runs briefly, then dies. Starter operates vigorously, but engine won't restart.*

Your gas gauge shows almost a full tank. You can see no fuel delivery in the carburetor throat when you work the accelerator pump. You disconnect the gas line at the carburetor and crank the engine. No fuel delivery. You disconnect the gas line from the inlet side of the fuel pump and spread a scrap of paper under the open end of the line. You go to the rear of the car and place your mouth over the filler opening of the gas tank and blow into the tank. You return and find the scrap of paper is still dry.

7 *Your engine runs very rough at all speeds; it has no power; it backfires through the carburetor.*

You find a wire loose in one of the distributor towers but shoving it in tight doesn't help. Routine check for spark and fuel doesn't yield any clues. Timing light indicates correct timing. Cylinder compression is normal.



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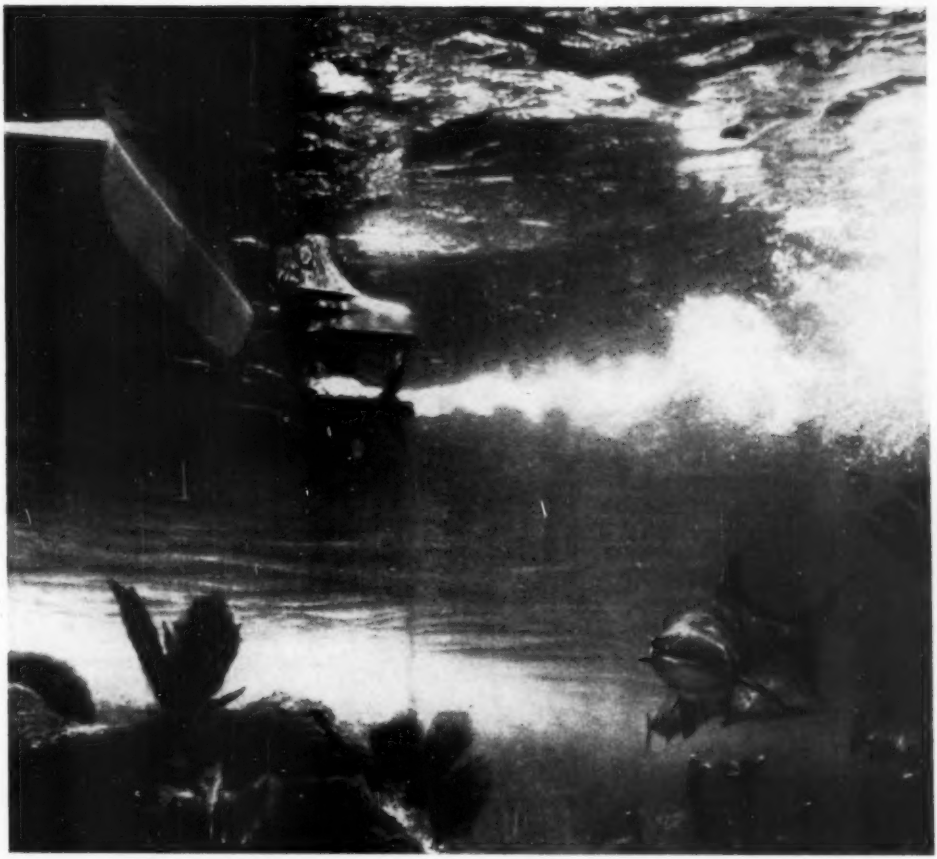


Champion-equipped outboards run smoothly. Test at Marineland, Fla., proves they don't even frighten fish.

Q. Why does every major manufacturer of outboard motors use Champion spark plugs?

A. Because Champions deliver the quick starts and dependable performance outboard owners want. For performance like this in your *car,* put in Champions every 10,000 miles. You'll save gas, too!

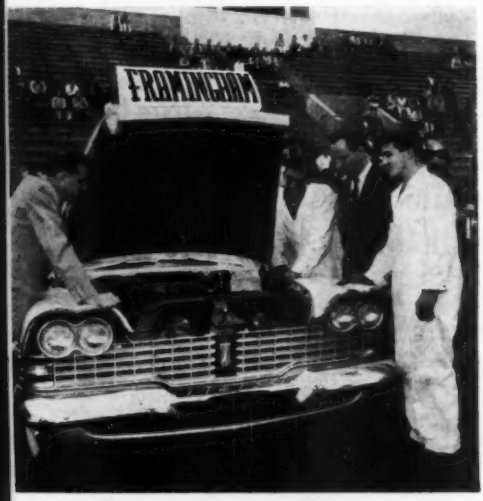
World's favorite spark plug—engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard and every major foreign maker.

CHAMPION

8 *Starter okay but engine won't start.*

Routine checks show that fuel is reaching the carburetor and there is good spark at the plugs. The plugs check; choke operation is normal; there is no indication of flooding.

Air-pressure tank *proved valuable to this team. Equipment choice is left to each team. Elaborate analyzers vied with a simple jumper wire and know-how. The jumper often came out ahead.*

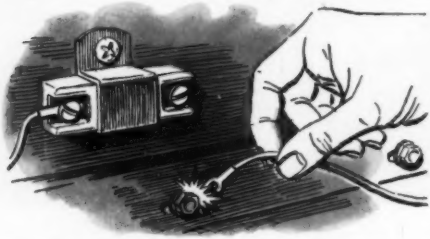


9 *Engine fires readily but won't run.*

You remove the air cleaner and check for fuel reaching carburetor, normal choke operation and idle adjustments—all okay. You get spark at the plugs when cranking, but no spark from the coil high-tension wire when the points are flicked by hand. You remove the primary wire from the distributor and find you get no spark when you touch it to the block. After puzzling this over for a few minutes, it dawns on you that you have been the victim of a prank.

10 *Starter operates but engine won't start.*

You find no spark at the plugs or from the coil high-tension wire to ground when the engine is cranked. You remove the primary wire from the distributor and with the ignition switch on, touch the wire to a clean spot on the engine block—no spark. Working back through



the primary circuit, you disconnect the wire from the battery side of the coil resistor—it sparks when touched to the ground. You replace it and try the wire connected to the battery side of the coil primary—no spark. Then you check all ignition primary wires and connections. They all seem to be in good shape.

Now turn to page 244 for the answers

Winners of the contest *at Salem, Mass., were Harold Clough and Donald Martin. They were offered jobs on the spot. With them is their instructor, Robert Thompson. At left is R. E. Johnston of Chrysler.*

Short Cuts and Tips
FROM PS READERS

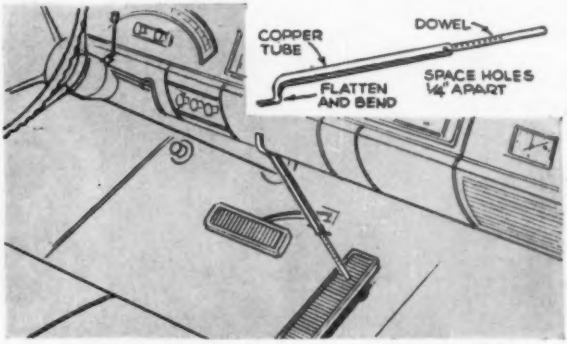
Tube Layout Upside Down

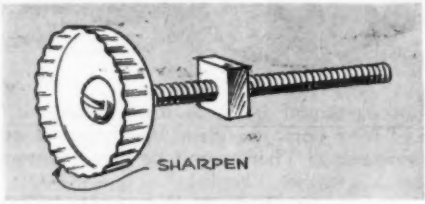
I PLACE a carbon paper, carbon side up, under the paper on which I draw the tube layout for a TV set. This gives me a top view on one side, and a bottom view on the other. This is fine for underneath work.—*S. Mammano, So. Pasadena, Cal.*

▶▶▶CLEAN paint from small metal parts such as hinges and knobs by boiling them in solution of trisodium phosphate. This is a white powder sold at most paint stores for washing grease and dirt off walls. Put enough water in an old pot to immerse the parts, add three or four tablespoons of the powder, and boil for about five minutes while stirring. Rinse parts in hot water.—*Andrew Vena, Philadelphia.*

Throttle Stick Is Adjustable

THE adjustable throttle holder (right) is intended to help in tune-ups or when warming a balky car that isn't fitted with a hand throttle. Place the bent end under the edge of the dash and the other end on the gas pedal. The dowel slides in the tubing and a nail will hold the pedal at desired speed.—*J. Hodel, Bradley, Ill.*





Hole Cutter for Soft Jobs

I CUT smooth round holes in such soft material as cardboard and leather with a sharpened bottle cap. I fasten the cap to a bolt, clamp in my electric drill, and sharpen the cap edge against an emery wheel. Then it makes cuts without burrs. —*R. H. Richter, Detroit.*

Toolholder from Tubing

RANDOM lengths of 1/2" and 3/4" aluminum tubing can be used to make fine toolholders, such as the one for pliers shown at right. Flatten a 3"-long section in the jaws of a vise. Leave the rest of the tube round, bend at a 45° angle to the flat and screw to the tool board.—*Arthur R. Tanner Jr., Poughkeepsie, N. Y.*

Gus Gets into a

That broiling sun gave Gus an idea. Could he use the thermometer to take the heat off a friend?

Sommers swept out one arm in an inviting gesture. "Make yourself at home, Mr. Wilson," he said.

By Martin Bunn

GUS Wilson sat tilted back in a chair against one side of the shaded Model Garage doorway. An oversize fan was aimed at him from the floor.

"Hot enough for you?" he asked.

Stan Hicks looked up in disgust. Naked to the waist, he was hosing down the paving around the garage. Suddenly he swung the hose nozzle around, just missing his boss, bent over and doused himself from waist to head.

Gus grinned. "I get the idea, Stan—no particular need to drown yourself."

"Why don't we close up shop and go swimming? There won't be any business on a scorcher like this."

Gus pointed down the street. "Slim Sommers has got himself a customer for his Continental Garage."

"Got himself a wreck," Stan answered, squinting at a tow truck hauling a heavy sedan with a damaged right-front fender and door. "And that car limping along behind with a bent front bumper had something to do with it."

"Say, that's George Crowley behind

Smashup

the wheel," Gus said. "Thought you told me he was representing a client up at county court?"

"He probably had the case postponed so he could rush back to be with his wife at the hospital." Stan sighed. "Hard lines. First his wife has an operation, then he has a smashup."

"Well, at least George can handle his own case in court if it comes to that."

"And I guess any struggling young lawyer can use a new client," quipped Stan.

Whatever retort Gus made was drowned

CONTINUED

out by the wailing noon siren. He got up and waved to his assistant. "Keep cool," he said, heading down the street. "I'm off to the air-conditioned diner."

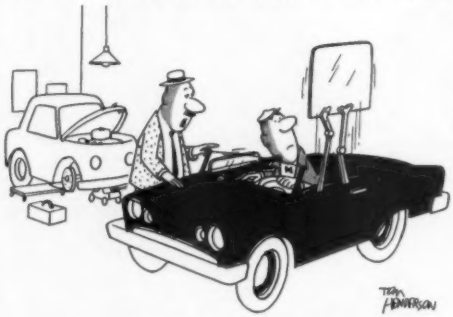
WHEN Gus returned he found the lawyer with Stan. Their faces were hidden behind wedges of watermelon.

Crowley dropped his rosy chunk to mop his perspiring face. He had his jacket off and the knot of his tie loosened.

"Hear you saw my car," he said wryly.

"Didn't look too bad from what I saw, George. How's the wife?"

"Fine, Gus. She'll be asleep now, so we've got a couple of hours to look into things."



"You'll like these power windows when you get used to them."

"We?" Gus asked. "Better brief me."

"Well, you see," Crowley began, "I ran into Tom Walker's car . . ."

"You mean Butterball, the insurance broker?"

"He's the one. But it was my fault," Crowley went on, "I was tired, worried—not too alert in my driving."

"Stop worrying, George," Gus said. "Your insurance will cover it."

"Not when it's lapsed. When Mary got sick I forgot to send the check. No, I'll have to pay out of my own pocket."

"Tough—with hospital bills," Gus sympathized. "But from what I saw of the car, they can't charge too much."

Crowley shrugged. "Sommers tells me I put Walker's transmission out of kilter. Those things run into dough."

"You must have banged into him pretty hard, George."

"No, I didn't. Honest," Crowley said, "I just can't figure the thing out at all."

"Okay, let's go see what's cooking. You're entitled to your own estimate—especially if you're footing the bill."

As they approached the Continental Garage, two men peering at the banged-up car presented an odd rear view.

One, a lanky six-footer wore a farmer's hat and coveralls cut short at sleeve and trouser ends. The other was five-by-five. Decked in a tropical helmet, a wild shirt, Bermuda shorts, he resembled three balloons stacked on sausage legs.

Slim Sommers and Butterball Walker turned around as Gus and Crowley arrived.

"WELL, look who's here," Sommers greeted them. "I kinda expected Mr. Crowley to bring his friend Gus Wilson over."

Gus walked over and examined the sedan's crumpled fender and dented door. "Just dropped over to check on the damage to Mr. Walker's car," he said.

"Tell him," squeaked Walker, pushing back his oversize helmet. "Tell him about the transmission."

"The frame and front end are okay," Sommers said, "but the transmission took a beating—it'll have to be replaced."

"I'm not doubting your word, Slim," Gus said, "but it doesn't look as if this car was hit hard enough to damage the transmission."

"Looks are sometimes deceiving, Gus," Sommers said pompously. "You know how collisions are sometimes—fender hardly dented, but you find a bent frame; hit a man in the rear wheel, bend the front axle."

"It happens," Gus agreed. "Okay if I check on a few things?"

Sommers swept out one arm in an inviting gesture. "Make yourself at home."

Gus started the engine and checked the transmission oil. Then he shifted into reverse. The car backed up, but wouldn't move in any driving range.

"Satisfied?" Sommers asked.

"Not yet, Slim. Let's push the car up on your lift."

With the car raised, Gus took a hydraulic gauge from his kit and connected

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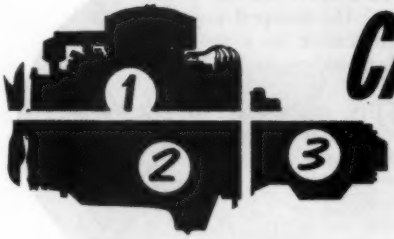

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The technical staffs of Casite and its parent organization, Hastings Manufacturing Company, specialize in just one thing—the maintenance of automotive engines. Working together, these experienced scientists and engineers have utilized the latest chemical discoveries to improve car performance, combat engine deterioration and wear.

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CASITE "SMOOTH-SEAL" . . .

For smooth, quiet, leak-proof performance, Smooth-Seal reduces jerks and roughness in automatic transmissions. Stops and prevents leaks due to hardening or shrinking of the transmission seals. Reduces shock and wear, enables delicate parts to last longer. List price $1.95.

use all 3 to keep your engine and automatic transmission clean . . . friction free . . . at peak operating efficiency.

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Casite Additives, Piston Rings, Oil Filters, Spark Plugs

it to pipe-plug outlets built into the transmission. He checked the drive-pump and accumulator pressures at various engine speeds. Then he removed the bell-housing cover and flashed a light inside. He turned to the car owner.

"Mr. Walker," he said, "I'd say that this transmission has been so hot that the nonmetallic seals and gaskets are seriously damaged."

BUTTERBALL bounced up from a chair he had collapsed in. "Then Crowley did it sure. My car was running smooth as silk before he crashed into me."

Crowley groaned. "And that means I'm stuck with a big repair bill."

"I'm not so sure, George," Gus said, rubbing his chin. "Let me ask Slim here a few questions."

"Look, Gus," Sommers said, "it's all cut and dried. I'll give Mr. Crowley a break on the bill."

"That's not the point, Slim. When did you pick up Mr. Walker's car?"

"All right, Mr. D.A. Wilson," Sommers said grudgingly. "It was 11 o'clock sharp. I looked at my watch because I was in a hurry to get home for lunch by noon so the missus could make a club meeting."

"And you almost made it. The noon siren sounded just after you passed the Model Garage. George tells me the accident took place at Orrville Junction—47 miles from my place. And you made it in one hour. That's pretty fast towing."

"So what?" Sommers challenged.

"So the transmission damage was caused by your tow, *not* by collision impact."

"Whoa, there, Gus—them's fighting words. I know enough about this kind of transmission to tow it in neutral."

"Sure you do, Slim," Gus said. "But that's not enough. The book says that even in neutral a dual-turbine drive should not be towed faster than 30 miles an hour on a normal summer day—around 80 degrees." He stopped and pointed at a big thermometer on a shaded post.

"Why," Crowley said, "it reads 102 right now."

"And," Gus continued, "it was much hotter at noon out in the sun. Then, too, Mr. Walker's car has a triple-turbine drive—which isn't safe to tow above 25 miles an hour."

"Then I'm not stuck?" Crowley asked.

"No, George. When Slim was towing, the front, motor-driven oil pump of Walker's car wasn't operating. And under that condition, even in neutral, the turbine develops drag, creating excessive heat."

Sommers had been listening thoughtfully. He looked at his wrist watch. "I have to make a phone call to check on some parts. Be right back."

While Sommers was gone, Gus and Crowley played the soft-drink machine, bringing a bottle of pop over to Walker, who had collapsed into a chair again, his red face streaming.

Sommers came out of his office. "Mr. Walker," he said, "you handle my insurance. Suppose I really did pull a fool boner like Gus says—am I covered?"

"Certainly," Walker said, bristling.

"Then you're getting a brand-new transmission on the insurance company."

"You're agreeing that it was your fault?" Gus asked.

"Well, yes, Gus, now that I've checked in the manual." Sommers grinned. "That was my 'phone call.' But I wasn't going to admit anything till I found out if my insurance covered it."

As Gus and Crowley left, the young lawyer was profuse in his thanks.

"All I did was estimate a wreck," Gus said modestly.

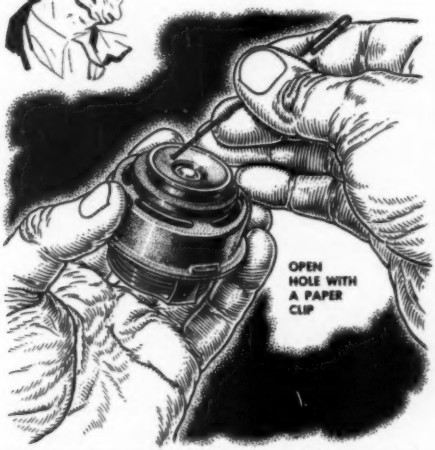
Crowley laughed. "And instead you wrecked an estimate."

Next Month: Gus fixes a race.

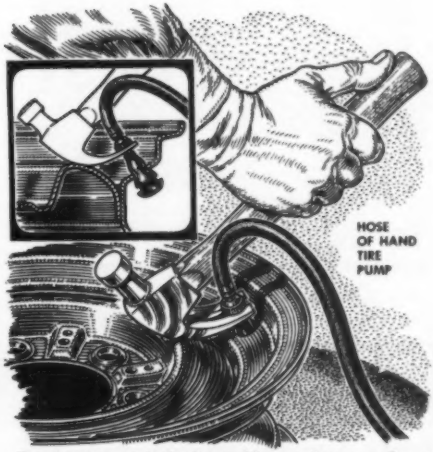
Where'd it come from?

Bushel: It would take a heap of "hollowed hands" to fill a bushel as we know it today, but that's what the word meant when the Celtic settlers of Britain used it. An American bushel contains 32 quarts; the English, 33.026. The difference? Colonists brought over English standards and kept them. The English changed theirs in the 19th century.

Hints from the Model Garage

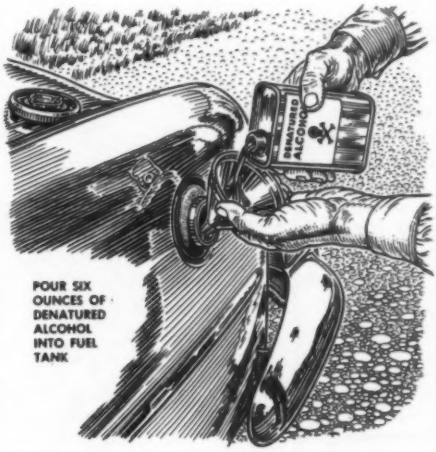


Whenever you remove a thermostat, check the air-bleed hole to see that it's not clogged with rust. A clogged bleed hole will trap air in the engine block, making it difficult to refill the system completely and overheating will result.



Replacing a tubeless-tire valve need not be difficult even if an installing tool is not available. Press the valve in the rim hole, then screw on the tire-pump fitting. Place a claw hammer under the fitting and pull the valve into position.

An over-tightened wheel nut can easily be removed by heating it briefly with a torch. Hold the wrench ready to loosen the nut the instant you take away the torch, before the heat transfers to the stud and expands it, too.



To clear the gas tank of water caused by condensation, pour in about six ounces of denatured alcohol—the kind you get at the paint store. The alcohol absorbs the water and burns away without causing the engine to miss.

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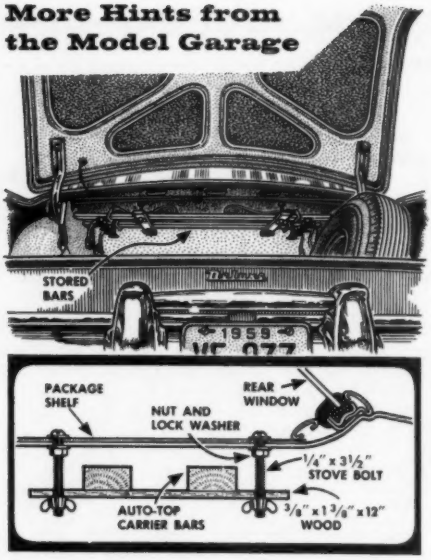
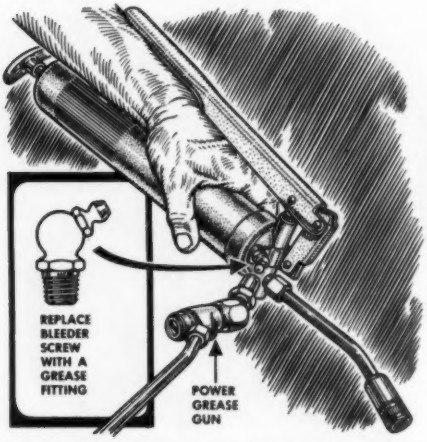
More Hints from the Model Garage

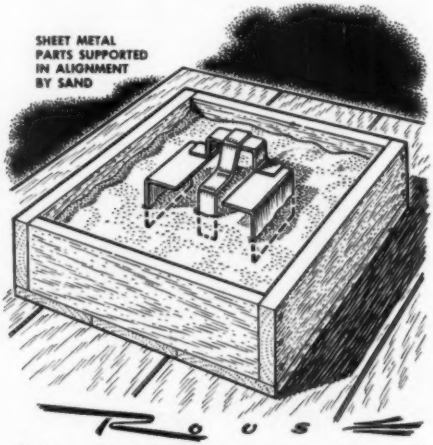


A car-top carrier can be neatly stored in the unused space beneath the rear package shelf in a sedan. Lock four long bolts in the shelf so they protrude into the trunk. Use wing nuts and wood strips to clamp the carrier between the bolts.

Block and tackle won't pull your car out of a soft back road or a sandy seashore if there's no place to secure the ropes. An effective "deadman" can be made by burying the spare wheel—the deeper the better—and using it as an anchor.



To eliminate the mess of spooning grease into a grease gun, remove the bleeder screw and install an ordinary grease fitting. You can then have the gun filled at any service station without opening it. Cost per filling is about 50¢.



A box of sand kept near the shop welding machine is useful for holding irregularly shaped parts together while they are tacked or brazed. Pressed in deep, the parts are firmly held, and the sand doesn't steal heat from the metal.

Short Cuts and Tips

FROM PS READERS

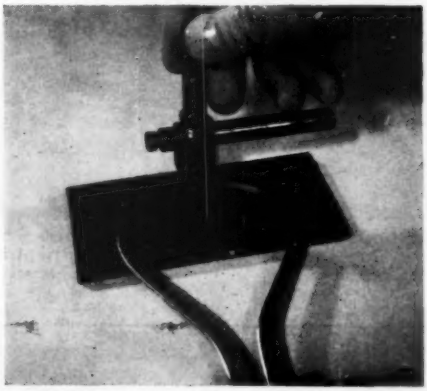
Quick-Removal Temporary Signs

TEMPORARY signs for parking or other directions at picnics and the like can be quickly set or removed if you staple them to steel U-rod uprights instead of wooden stakes.

Bend each rod end at two right angles and you can drive them into the ground with one foot.—*G. E. Hendrickson, Argyle, Wis.*

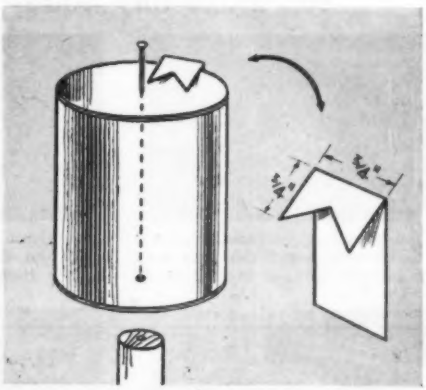
▶▶▶AFTER you open a paint can for the first time, punch several holes in its recessed lip. Then, when you close it, leak paint through the holes. It will form a seal that will keep the leftover paint from hardening and forming a scum on top.—*E. L. Enochs, Modesto, Cal.*

▶▶▶MY washing-machine timer shorted repeatedly because of high humidity in the basement. I put a replacement in a plastic freezer bag, after making the connections, and closed the mouth with a rubber band. The timer has never shorted since.—*Robert A. Brown, Shelbyville, Tenn.*



Setting a Hole Cutter

A QUICK, accurate way to set a hole cutter is with calipers opened to exactly the required diameter. Hold the cutter upright with its centering drill in a shallow hole in hardboard scrap. You can then set the cutting chisel so it barely touches both caliper legs when given a half turn.—*Ken Murray, Colon, Mich.*



Easily Made Fruit Picker

YOU can make an efficient fruit picker by nailing a tin can to a long pole. Flatten the can slightly on one side and solder on a piece of stiff tin or brass, notched and bent at right angles. To use the picker, push the cup over the fruit with the stem in the notch and pull gently.—*R. C. Roetger, Warrington, Fla.*

Now... a camera built to THE KODAK SIGNET 80

Whether you work in wood, metal, or plastic . . . skin-dive or study the stars . . . specialize in sports cars or specimen roses . . . aircraft models or model rail layouts . . . electronic experiments or action photography . . . *this Kodak Signet 80 Camera should be your teammate and companion.*

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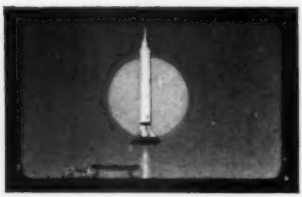
Precision camera? Yes. Expert's camera? Yes—but you don't have to be an expert to operate it. Kodak, in the American tradition, has created a camera with all the features the experts demand—but easy-to-use in every feature.

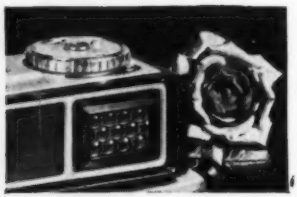
See the superb new Kodak Signet 80 Camera at your photo dealer's. Examine the interchangeable lenses. Test the photoelectric meter, the "natural-size" finder, unique new "injection" loading, the connectors for both flashbulbs *and* electronic flash. It's *the* camera to team up with your hobby. Yours for only $129.50, with 50mm *f*/2.8 lens—or as little as $12.95 down.

Here are a few ways the Signet 80 Camera can make any hobby richer, more rewarding . . .

You get needle-sharp pictures with the coupled rangefinder—2½ feet to infinity! Couples to all lenses.



You shoot exactly what you see, with the brilliant big-as-life viewfinder. Image is life-size!



You read exposure easily—with ultra-sensitive photoelectric meter! Sets for all films.

You change lenses instantly—switch to wide-angle or telephoto. Just drop in, start shooting!

You pull in faraway scenes, take candid portraits with the telephoto lens. (90mm *f*/4, $69.50)

You capture the broad sweep of a scene with the wide-angle lens. (35mm *f*/3.5, $57.50)

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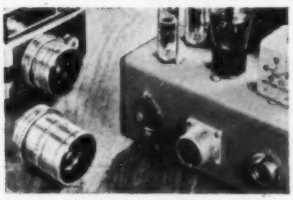

Near or far, you capture extra detail with Signet 80 rare-element-glass lenses. Superb for color.

You load film fast—drop it in, close the camera. You can do it with one hand, blindfold!

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You click off rapid-sequence shots with thumb-action film advance. Sets shutter too, counts shots.

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"

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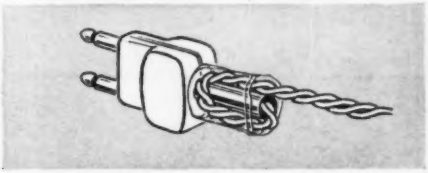
Short Cuts and Tips
FROM PS READERS

Movie Screen on Back of Picture

I MADE a movie screen out of a large picture on my living-room wall simply by backing the picture with a sheet of white cardboard. When I show movies, I turn the face to the wall.—*Harold Shanks, Hollis, N.Y.*



Preserving Hearing-Aid Cord

HERE'S one way to keep a hearing-aid cord from breaking where it enters the plastic tube to the plug. Double it back and bind it in place with adhesive cellophane tape. The tape is more flexible than the tubing and won't cause wear.—*F. Leslie Whitaker, Lawrenceville, Ill.*

Centering Blind Dowels

SOLDER the heads of metal thumbtacks together in pairs and you have good center markers for drilling holes for blind dowels. Spring-type clothespins make good soldering clamps. Clip the points to half their length before joining the heads.—*Ken Murray, Colon, Mich.*

One-Man Platform for Raising Ceiling Board

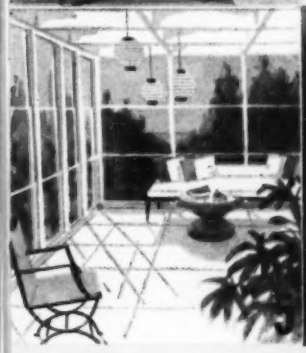
WHEN you put up full-size ceiling board, you can hold it in nailing position without help on a frame like this. It is a 3′-by-4′ open platform of 1″-by-2″ rough strapping pivoted with stove bolts to a folding frame. Make the legs slightly longer than the ceiling is high. Spread them to put a board on top, then push them together to raise it into place.—*C. A. Fenner, West Vancouver, Canada.*

POPULAR SCIENCE Monthly

SPECIAL Home Improvement Supplement

FALL 1959

7 New Working Plans for Improving Your Home



1 *How to Install Mural TV*

2 *A Mower Port for Outdoor Storage*

3 *Garage Catchall, a Problem Solver for Everyone*

4 *How to Build a Bookshelf Desk*

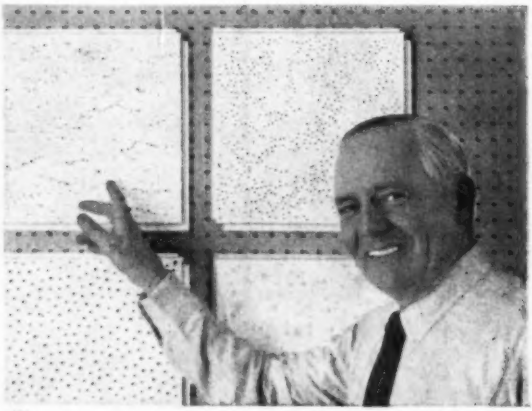
5 *A Modern Way to Enclose a Porch*

6 *Two-Way Plumbing Wall for Rumpus Room*

7 *Bunk Bed That Hangs from the Ceiling*

How to buy a new Armstrong ceiling and install it in any room in your home this week end

1. Right now—Look at your ceiling. Is it cracked? Peeling? Imagine how beautiful the room would be with a new Armstrong ceiling. Quiet, too. Armstrong ceilings soak up noise.



2. Friday—Go to your Armstrong Lumber or Building Materials Dealer. He's listed in the Yellow Pages under "Ceilings." He'll show you all the new Armstrong ceiling designs.

3. Saturday—Put up the ceiling yourself. Your dealer will show you everything you need to know. Just follow his simple step-by-step instructions. He'll even lend you a stapler.

4. Sunday—Relax in a home that will be Sunday *quiet* every day of the week. Your beautiful new Armstrong ceiling is washable, needs no painting, and will never crack or peel.

We'd like to send you a free booklet about Armstrong ceilings. Write Armstrong Cork Co., 99 Oak St., Lancaster, Pa.

Armstrong CEILINGS

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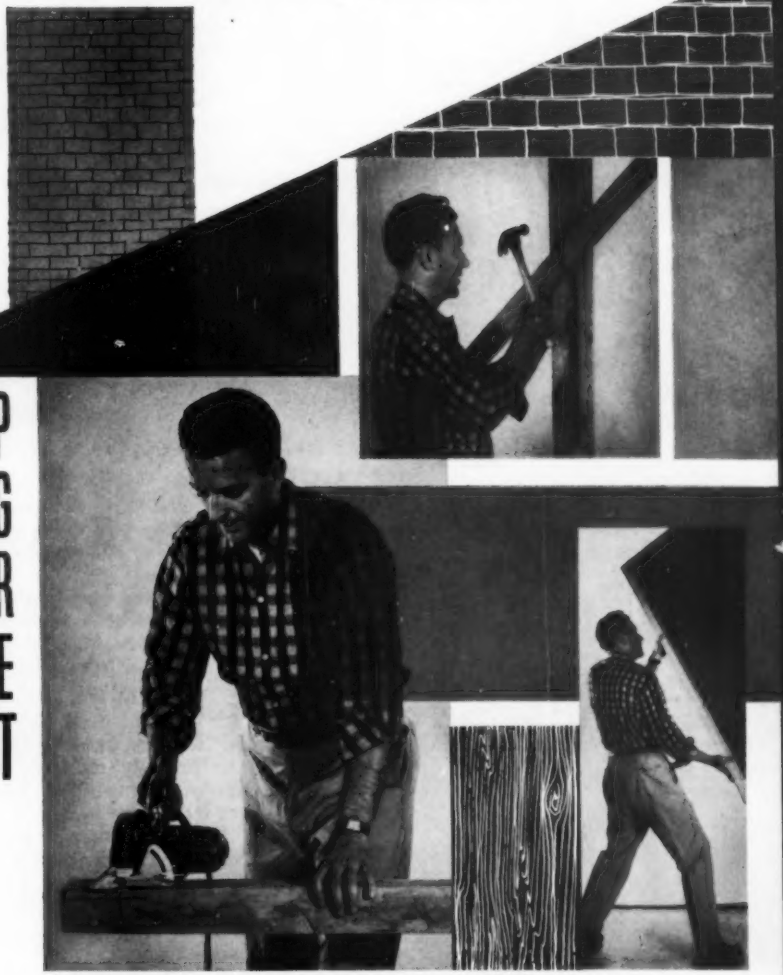
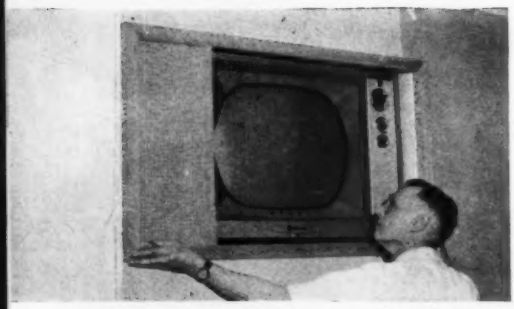


NRLDA National Retail Lumber Dealers Association
18th & M Streets N. W., Washington 6, D. C.

PS Home Improvement Plan I

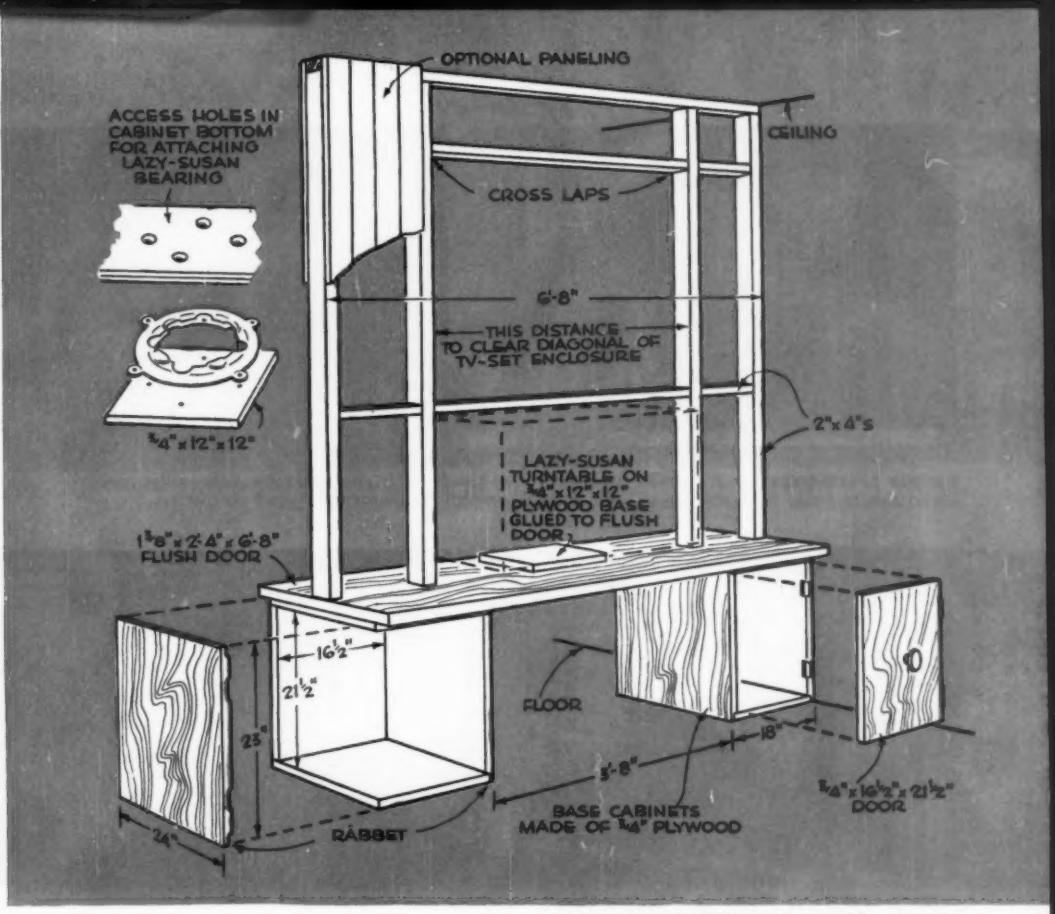
How to Install Mural TV



REMOVABLE PICTURE FRAME completes the installation of this color set in a living-room wall.

HOW'D you like to hang your TV picture on the wall? Although it may be several years before you can literally do that, with RCA's new line of "Mural-TV" sets you can easily get the same effect.

The obvious advantages of picture-on-the-wall TV have led many home owners to pay for expensive, custom-built installations. Now, however, a major manufacturer is offering complete packages at mass-production prices. They are designed to be built in without fuss about the electronics. You even have a choice



BASIC ROOM-DIVIDER DESIGN readily adapts to meet your needs. You may want to panel the upper part or leave it open, or use it free-standing or with one end attached to a wall. TV set swivels for best viewing from any place in the living room, or swings around to let you watch from the dining area. Pedestal cabinets can be ready-made unpainted furniture units.

of ready-made picture frames to go with various decorating schemes. But you don't have to buy these if you prefer to make your own.

Four different receivers are available: a 17″ black and white that is less than 12″ deep, a standard 21″ black and white, a 21″ black and white with remote control, and a 21″ color receiver. Speakers are optional extras. You can get an 8″ extended-range speaker, or a two-way speaker system with two 3½″ tweeters and an 8″ extended-range. A detailed installation guide comes with each set.

Sets are enclosed in a protective steel housing with a safety covering for the picture-tube face. Out-in-front operating controls permit mounting the set flush with the wall.

Prices are only slightly higher than for the cheapest table model using an equivalent chassis. If you do the carpen-

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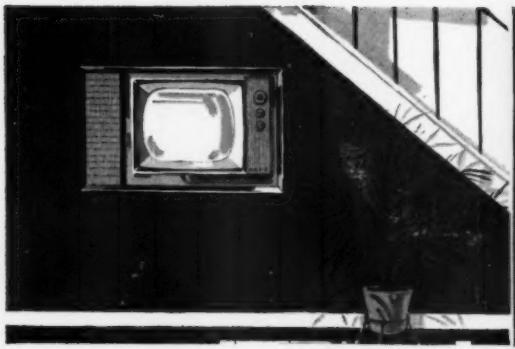
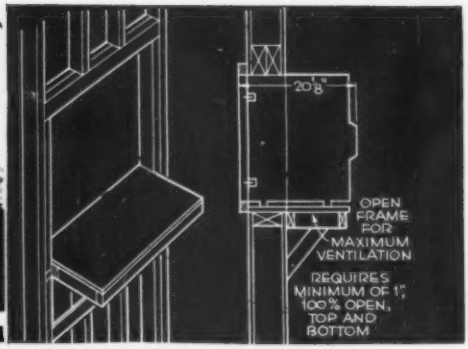
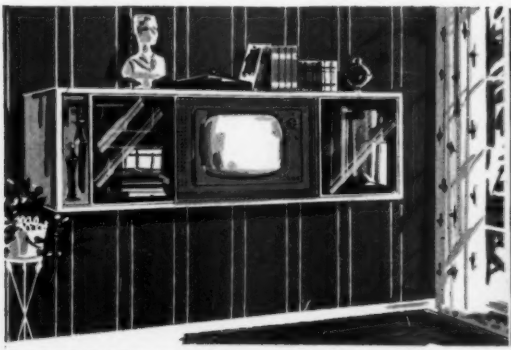
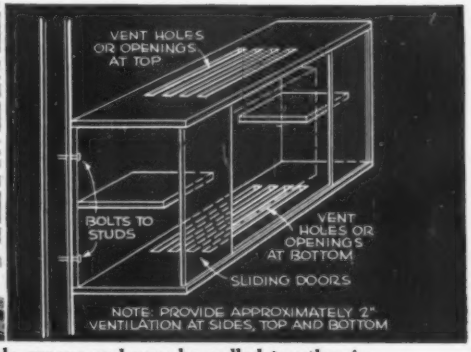


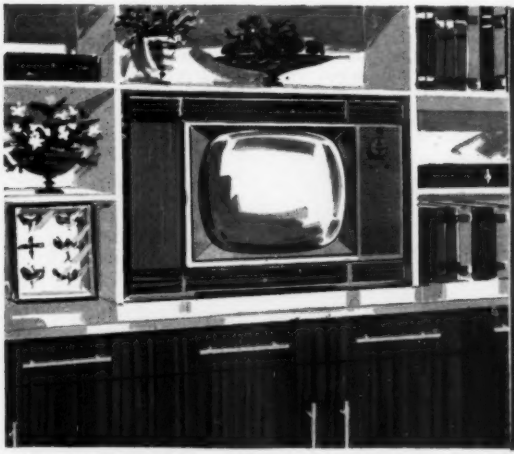


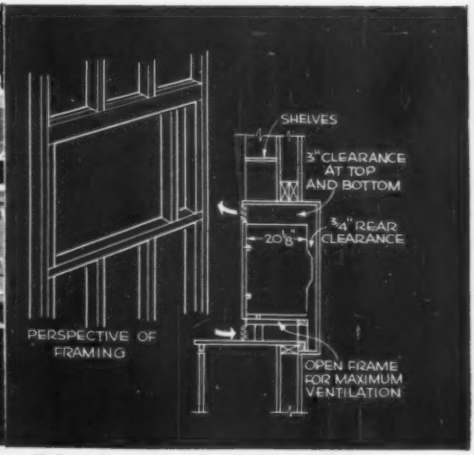
UNUSED SPACE UNDER A STAIRWAY makes an ideal spot to build in a set. Usually the back of this wall is accessible from the cellar stair, simplifying construction and ventilation.



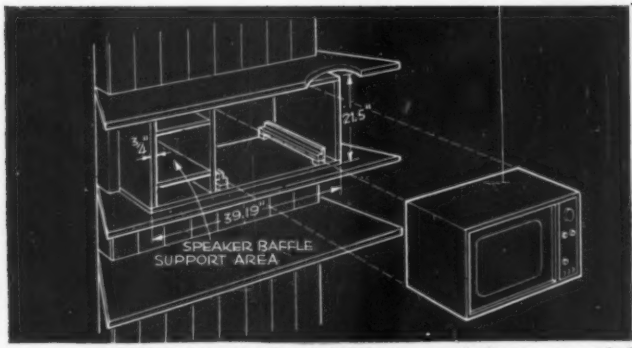


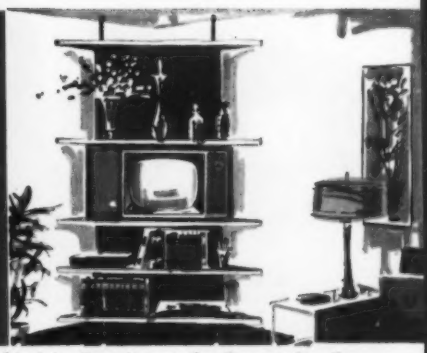
CABINET BOLTED TO STUDS on a bedroom wall will house the slim 17" set. Mirror doors slide in a single groove and may be pulled together in the center to hide set when it is not in use.



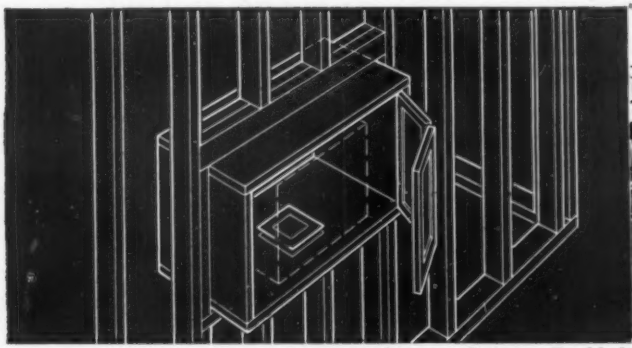


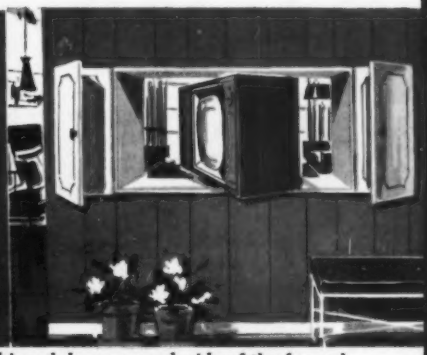
READY-MADE FRAMES providing front ventilation will let you build a set into a cabinet wall. You get all the advantages of mural TV without need to cut into the structure of the house.





CORNER-CABINET INSTALLATION is a good alternative if you don't have a wall with suitable space behind it. Opening at the floor and ceiling gives chimney action for rear ventilation.





SWIVELING SET IN THE WALL between living room and den lets you watch from either room. Double-hinged doors on each side of the framed opening can be closed to conceal the unit.

try yourself or have it included when you build a new house, you can get TV performance equal to the most expensive console, plus the advantage of picture-on-the-wall TV, for little more than you'd pay for a conventional table model.

For those with an itch to own color TV who have been stopped by the high price tags, RCA says that some lending institutions are allowing the cost of built-in TV to be included in the mortgage on new houses.

WANT WORKING DRAWINGS? RCA will send you plans for the basic room-divider unit with the swiveling TV set. You can also get detailed installation guides for each set, as well as other suggestions and ideas for installing mural TV. Write to: Mural TV, Radio Corporation of America, Cherry Hill, Camden 8, N. J.

LAZY-SUSAN BEARING gives positive swiveling action. Access holes drilled in the panel to which it is first attached will let you reach the screws to fasten it to the second panel.

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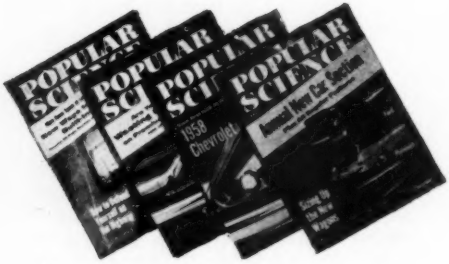

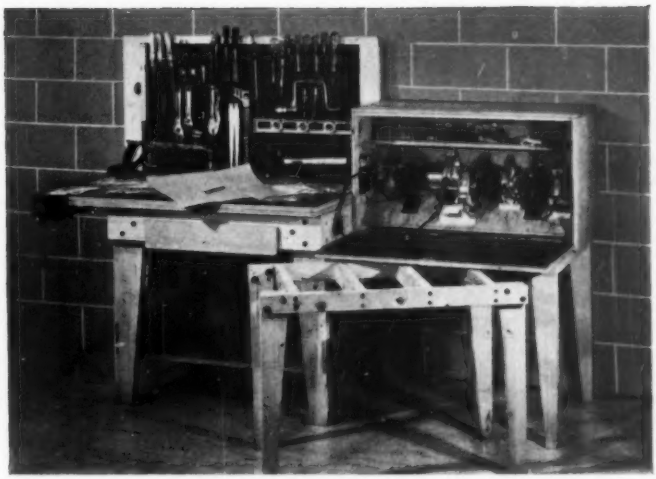

The Popular Science Split-Level Home Workbench—a new and revolutionary workbench design—the dream of every workshop owner!

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Complete 12 volume sets of encyclopedias will be awarded to any 25 winners who enclose a sales slip along with their entry blank. To qualify for the extra prize, winners must purchase a product of advertisers appearing in the booklet featuring the entry blank . . . available at dealers shown on the following pages.

If your local Building Supply or Hardware dealer does not have an entry blank booklet . . . mail name and address to Popular Science, Dept. 1106, 355 Lexington Avenue, New York, New York for your entry blank.

All entries must be postmarked by midnight October 31, 1959. In case of tie, duplicate prizes will be awarded. All entries will be judged by Popular Science editors.

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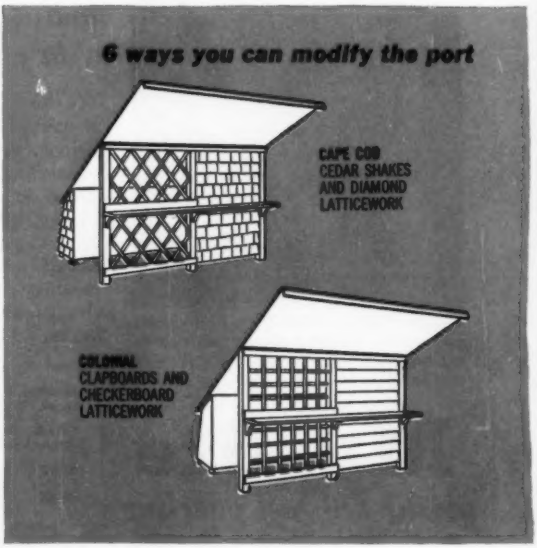
RIDING mowers are trundling around all over America. But for many people, the wonderful little machines present a storage problem. They shouldn't, however, when it's possible to build this handsome, sturdy and many-ways-useful mower port in a weekend. It'll cost not much more than $100 for materials.

More than just a shelter, it's a whole garden-control center, with room for all the yard-grooming equipment that's now cluttering up your garage, carport or basement. Here's what it offers:

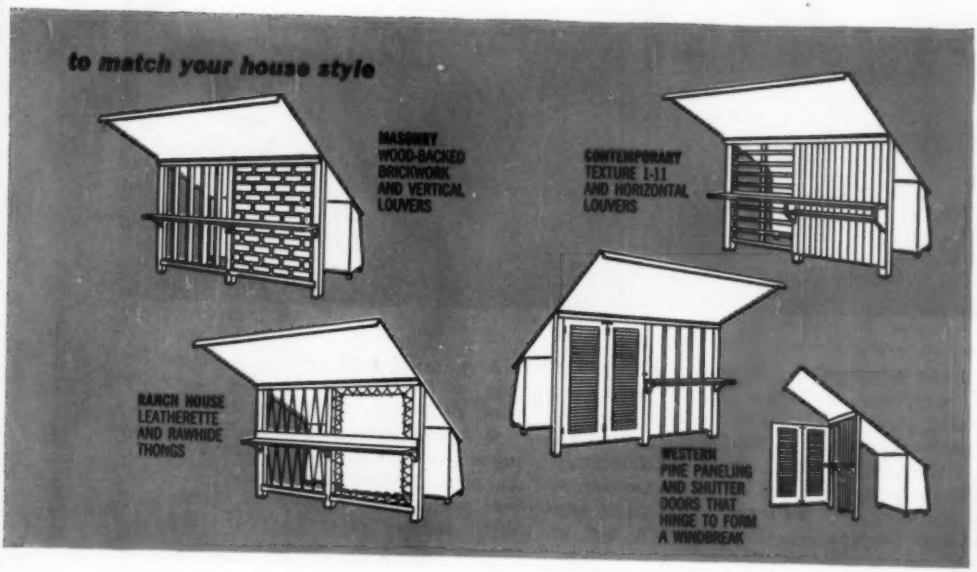
- A shelter eight feet long, three feet wide, and from three to five high for your mower or a midget tractor. Room to spare for a wheelbarrow, and the youngsters' bikes and scooters. You can enter the port from either end—no maneuvering to haul out the rig you want.
- A broad expanse of interior wall on which to hang rakes, hoes, shovels and



MOWER PORT has space for tools ordinarily cluttering the garage, plus shelter for puttering with plants—and shade for sheer loafing.

WEATHERPROOF LOCKER stores smaller gardening gear near point of use, permits flammable mower fuel to be moved away from house.

for Outdoor Storage



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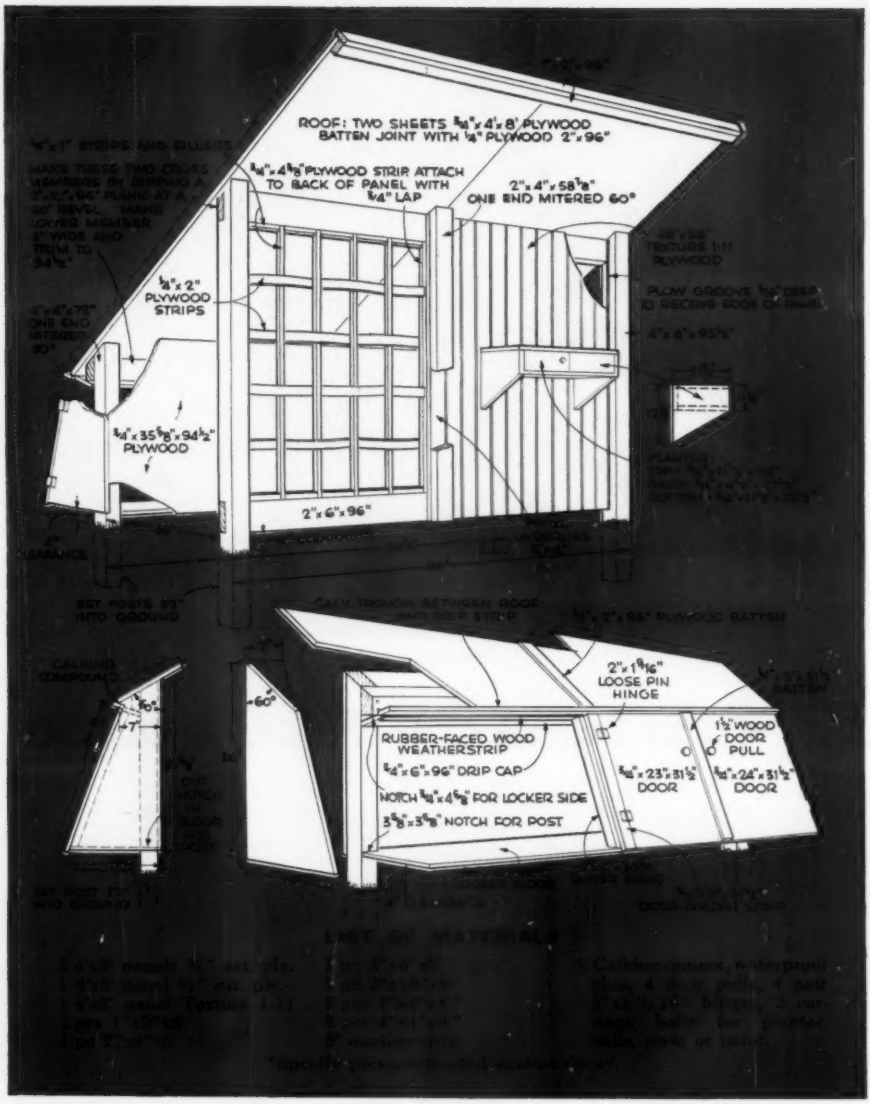

that ever-troublesome, bulky stepladder.

• A storage locker nearly eight feet long. Easy to get at, because its four big doors are on the outside of the port. This is the place to tuck away small garden tools, hose, fertilizer, and insecticides. A safe place, too, for motor fuel, paint and other flammables. Everything's out of sight—and the weather.

• A broad roof overhang on the high side of the shed, providing shade and wind protection for lounging.

• A solid exterior wall section supporting a work shelf for potting and mixing, combined with a latticework area. Or, if you prefer, all wall, or all latticework. With further slight modifications you can make the mower port conform with

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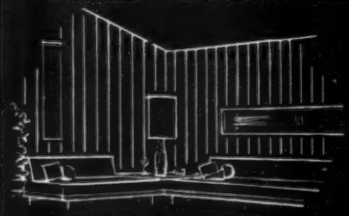

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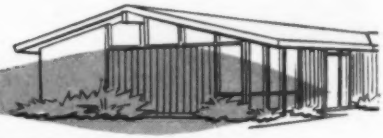

13 REZ COLOR-TONES

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For name of your nearest dealer, consult the YELLOW PAGES of your telephone directory.

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RIPPING TWO-BY-TEN at 60° bevel makes both top pieces. Lower one's broad face should be 4" wide; make sure the members are level.

DRIP CAP is nailed to both bottom edge of door frame and roof. Rubber-edged weather strip keeps rain from entering behind doors.

the architectural styling of your own home.

Construction tips. For economy and simplified construction, the mower port is built entirely of standard lumber and big sheets of fir plywood, exterior type. Precutting the parts will save you a substantial amount of time.

The perspective plans give you all the dimensions and details needed for assembly. But here are additional pointers:

- When you plow the 7/16"-by-7/16" groove in one of the forward posts to accommodate one edge of the Texture 1-11 plywood, place it ¼" back from the notches for the horizontal framing pieces. You must do this because the edges of the panel are lipped. Test to make sure it will accommodate the narrower lip. Rip the wider lip off the other edge.
- Use waterproof glue for all joints. This will make the structure materially stronger.
- Note that the drip cap is slightly angled in relation to the top edges of the doors. When hanging the doors, place them so they wedge very slightly against the underside of the cap when they're in closed position.
- Space out the lattice strips equally. No dimensions are given in the plan because variances in the true widths of the framing members could throw them off.
- Fill the trough between the roof and drip cap with calking compound *after* the wood has been sealed or prime coated. Most types of calk-

EDGE STRIPS for basketweave latticework are formed by nailing a 1½" strip of ¾" ply to back of panel with half the width exposed. At left, a ¾"-square strip is nailed to post.

FILLER BLOCKS nailed to horizontal framing members prevent upright strips from twisting when horizontals are woven. Give yourself room to slip in horizontals before spacing.

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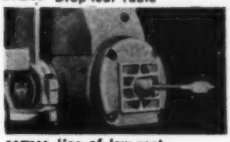

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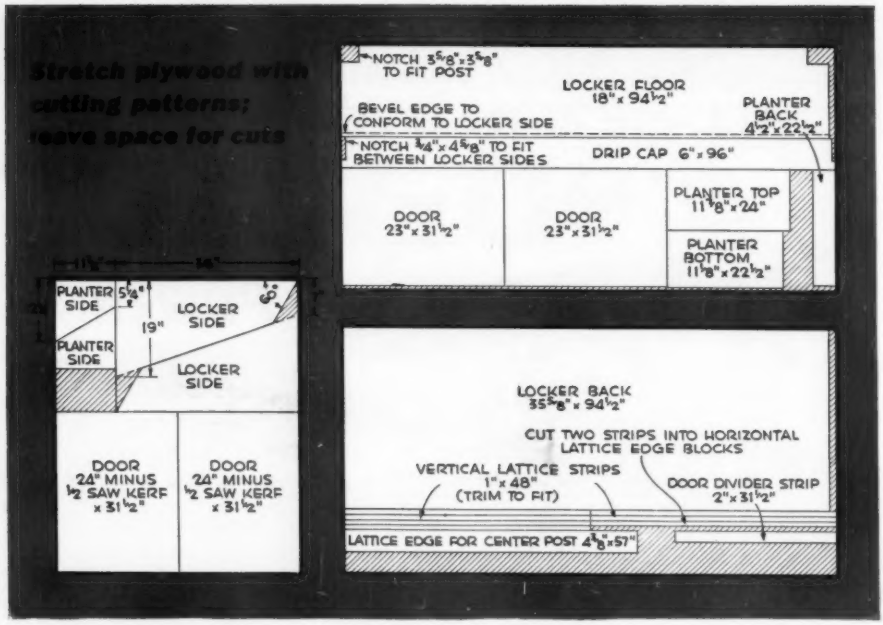

ing stand up better when used this way.

● For weather protection, as well as good looks, paint or stain the port. If you use paint (perhaps to match your house), begin with a prime coat in the usual way. If you apply stain, choose a heavy-bodied type; a thin one won't give the wood enough protection.

THE DOUGLAS FIR PLYWOOD ASSOCIATION has added this mower port to its latest list of plans. If you like the convenience of working from such a separate plan, send a postcard asking for free plans to build the mower port. Address it to Douglas Fir Plywood Association, Tacoma 2, Wash.

SHORT SECTION OF TWO-BY-FOUR, with narrower plywood strip above it, forms the central door hanger. Fill the trough between roof edge and drip cap with calking compound.

DOOR PULLS COMPLETE THE LOCKER. Plywood strip on one door overlaps other of pair to keep out rain. Doors close against rubber edge of weather-stripping door stop.

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Wallboard and USG® Ceiling Tile

WHY *is SHEETROCK Wallboard best for building and beautifying walls?*

Wall of WOODGRAINED SHEETROCK, Cherrywood finish | Wall of Panel SHEETROCK, striated finish

Types for every need Versatile SHEETROCK Gypsum Wallboard is available in panels four feet wide or 16 inches wide. The long edges of panels are made tapered, square, or beveled, permitting a variety of decorative effects.

Beauty for every taste Easy-to-install SHEETROCK Wallboard offers you a wide selection of pre-decorated finishes, or it will take any finish: paint, wallpaper, fabric, texture.

Extra protection, too SHEETROCK is more than just incombustible. Water of crystallization is chemically combined in gypsum by Nature to offer extra natural resistance to fire.

Lasting value Durable, economical SHEETROCK builds sound, sturdy walls and ceilings that can take the hard wear of daily living with minimum care, maintains your investment through the years.

(SHEETROCK is also made by Canadian Gypsum Company, Ltd., Toronto and Montreal.)

WHAT *kind of SHEETROCK Wallboard is best for your particular need?*

Walls of regular 4′ x 8′ SHEETROCK

Wall of 4′ x 8′ SHEETROCK in Sablewood finish

Panel SHEETROCK in Ranch Pine finish

WOODGRAINED SHEETROCK This wallboard, standard 3/8″ thick, with beveled or square edges, is predecorated to give the appearance of natural grain of wood paneling: Cherrywood, Sablewood, or Ranch Pine.

PANEL SHEETROCK These 16-inch-wide panels were designed to achieve the effect of paneled walls. 3/8″ thick, with rounded edges. Panel SHEETROCK comes in Ranch Pine and a Striated finish, or it is available plain to take any decoration.

REGULAR SHEETROCK This standard wallboard comes plain, to take your choice of finish. It is available in four thicknesses, including 3/8″, recommended for remodeling. Tapered edges permit joints to be concealed and reinforced with PERF-A-TAPE* Joint System.

INSULATING SHEETROCK This wallboard has bright aluminum foil laminated to its back surface, providing reflective insulation and minimizing harmful condensation in wall cavities.

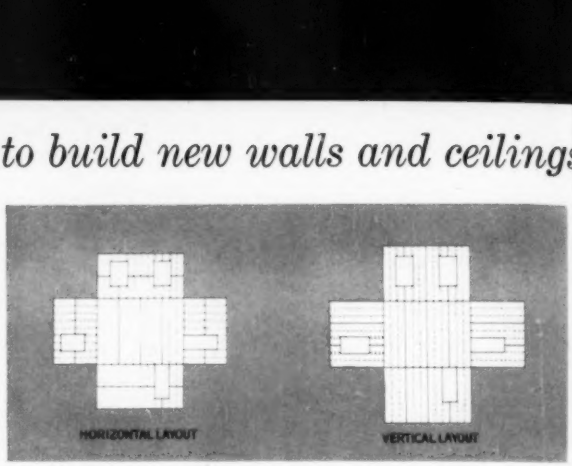
SHEETROCK FIRECODE This product is designed to meet the requirements of building codes that call for even higher fire-resistance ratings.

*T. M. Reg. U. S. Pat. Off.

HOW *to build new walls and ceilings*

Tools and materials you'll need

- 3/8" SHEETROCK Wallboard
- PERF-A-TAPE* Joint System
- 1 3/8" 4d cooler-type nails (bright finish)
- A sharp cutting knife
- Keyhole saw
- Straight-edge
- Rule or measuring tape and pencil
- Hammer
- Application knife
- Mixing bucket and stirring paddle
- Bread pan
- Sanding block



PLANNING THE JOB First, measure the room. Then, make sketches like the ones above. Draw two horizontal lines crossed with two vertical ones. Close in the four ends, and you have a drawing representing ceiling and walls. Draw in doors and windows. Now indicate SHEETROCK panels—4′ wide, lengths from 8′ to 14′. If ceiling height is 8′ 3″ or less, plan horizontal installation of panels; if more than 8′ 3″, plan vertical installation. Use plan to order SHEETROCK. Then, *FOLLOW THESE SIMPLE STEPS:*

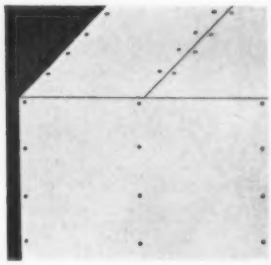
4 When horizontal construction is used, the top wall panel should be applied first and butted against the ceiling. End joints should be on studs. Where possible, span entire wall. End joints should be staggered. If Insulating SHEETROCK is used, apply foil side to framing.

5 Cut-outs for electrical switches and outlets can be made with a keyhole saw. To locate the exact position, hold SHEETROCK panel in place. Then, using a wood block to protect the board, tap around outlet with a hammer. The indentation on back of the board is your guide for cutting.

6 To reinforce and conceal joints, use a 4″ or 5″ wide application knife, mixing bucket, bread pan and PERF-A-TAPE Joint System. Mix cement according to directions in the package and butter it into the channel formed by the tapered edges of SHEETROCK Wallboard, filling channel evenly.

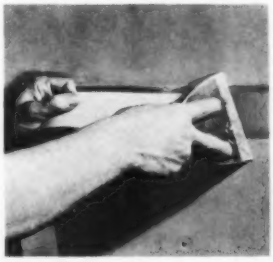
gs with SHEETROCK Wallboard

1 Score the paper on the face of the board with a sharp knife, using straight-edge as a guide. Break the gypsum core of SHEETROCK by bending away from scored paper side. Cut back paper and sand edges smooth.



2 Drive nails not less than 3/8" from the edges and ends of SHEETROCK, spaced apart 7" maximum on ceilings and 8" on walls. During nailing, press board firmly against studs and joists or existing surfaces. Leave slight "dimple" over each nail head.

3 Apply ceiling first. One man can install it by temporarily nailing 1" x 2" wood strips below ceiling level, forming a shelf on which to rest the edge and/or end of SHEETROCK. Nail from center of panel towards ends and edges.



7 Center PERF-A-TAPE reinforcement and press it into channel with knife held at convenient angle to board. Draw along joint to remove excess cement, leaving enough under tape for proper bond. (Panel SHEETROCK, designed to leave joints showing, does not require PERF-A-TAPE application.)

8 Cover tape with a thin layer of cement to fill channel. Allow to dry overnight, then sand. Cover with second coat; feather edges about 2" beyond edges of channel; allow to dry; sand lightly. Follow with "finishing" coat; feather edges of cement; sand when dry. Fill all nail depressions with cement to level of wall surface.

9 PERF-A-BEAD* metal corner reinforcement provides added protection for outside corners. It is easily applied with PERF-A-TAPE cement. Also ideal for reinforcing uncased openings, columns, beams. Use PERF-A-TAPE Joint System for inside corners and for curved edges.

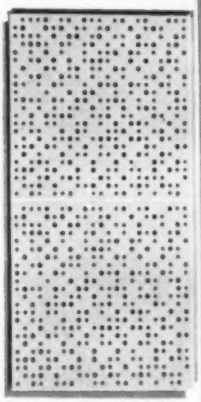
WHY *are USG Ceiling Tiles best for building and redecorating ceilings?*

Ceiling finished in Perforated QUIETONE*, a USG FASHION TILE in Random Line pattern

Beauty for any room USG Ceiling Tiles are designed to help you decorate as you build a completely new ceiling. By choosing from many tile designs, you can create almost any ceiling design you desire. From tiles with light-reflecting finishes to the celebrated FASHION TILES, you'll find the right tile to suit your taste, to crown your rooms with glory.

Quiet for better living Freedom from the noise of modern life is right at your fingertips with USG Acoustical Tiles. Thanks to famous U.S.G. research and product development, these new tiles actually trap up to 70% of the noise that strikes their surfaces. As you build and beautify your ceiling, you can quiet your room, as well.

Easy installation USG Ceiling Tiles are designed especially to go up easily, with nailing, stapling or adhesive application. If you wish, you may select your tile in the 12" x 24" size, twice the size of square tiles, for even faster application. USG Ceiling Tiles are economical, too.

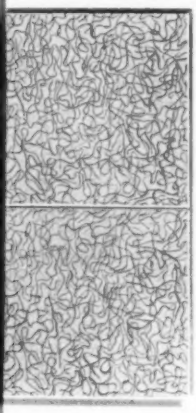


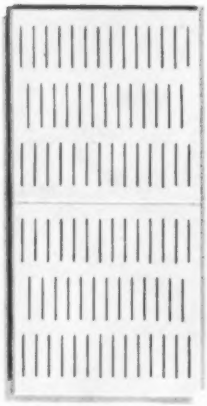
Perforated QUIETONE Acoustical Tile in light-reflecting finish

*T. M. Reg. U. S. Pat. Off.

WHAT *kind of USG Ceiling Tiles are best for your particular needs?*

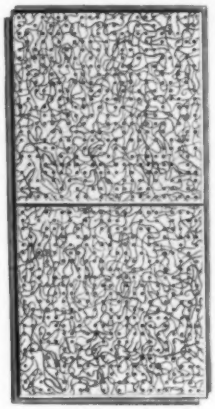
Insulating TWIN-TILE, a USG FASHION TILE in Random Line Design

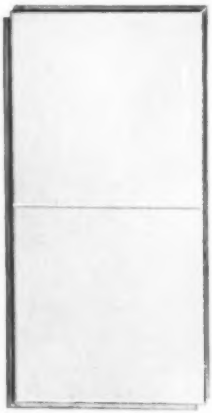




Slotted QUIETONE Acoustical Tile in Hi-Lite finish

Perforated QUIETONE, a FASHION TILE in Random Line design





USG CUSTOM TILE, an insulating tile in bright white finish

USG FASHION TILE These beautiful tiles, designed by famed designer Gyorgy Kepes, help you achieve a smooth flow of pattern across your new ceiling. You have a choice of Rib or Random Line designs, in Pewter Gray or Coppertint colors to harmonize with any room decor.

QUIETONE ACOUSTICAL TILE Noise is no longer a nuisance when you install QUIETONE. Perforated or slotted noise traps are carefully engineered into each tile, to capture up to 70% of all sound that strikes its surface. The light-reflective finishes of these tiles can be painted, if you wish, without affecting their noise-blotting qualities.

USG CUSTOM TILE This is a new insulating tile, designed to bring comfort to your rooms. A new, brighter white finish bathes any room in enduring beauty.

INSULATING TWIN-TILE You can build, insulate, decorate with this product—two tiles that go up as fast as one. Hi-Lite finish; takes paint, if you wish.

INSULATING PANEL TILE An unscored rectangular tile that may be used alone or with other tiles to create ceilings with rectangular patterns, interesting "mosaics."

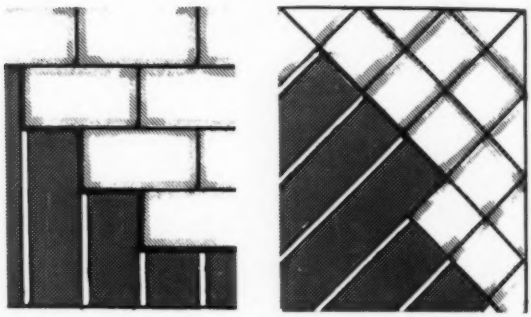
HOW *to apply USG*

Tools and materials you'll need

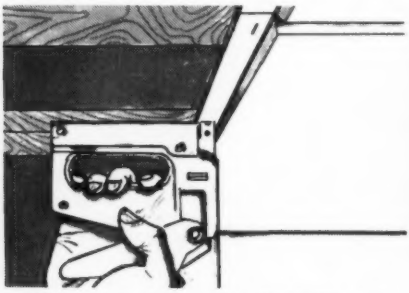
Trigger-type stapler and 9/16" staples, or
Hammer and 1⅛" lath nails
Hand saw or fiber board cutting knife
1" x 3" furring strips
Straight-edge
Rule or measuring tape
Chalk line
Carpenter's level
Pencil

Getting ready

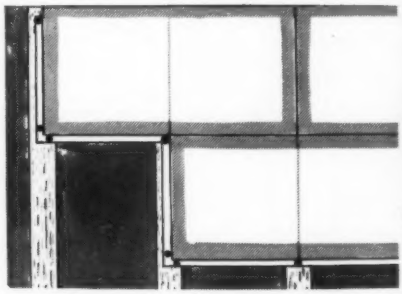
To plan the job, make a scale drawing of the ceiling on paper. Indicate location of light fixtures, columns, etc. Draw layout of tile pattern on diagram. This helps determine quantity of tile needed.



1 Unless you can apply tiles directly to existing ceiling with adhesives, your ceiling must be prepared by furring. First, measure the length of ceiling joist and mark exact center point. Snap chalk line at right angles to joists at this point. Then apply furring strips parallel to chalk line (right angles to joists) spacing them 12" on center. For diagonal application, snap chalk line across joists from corner to corner of the ceiling, and apply strips parallel to line.

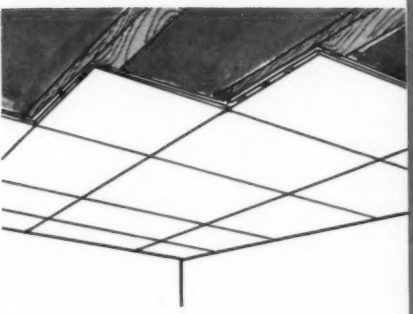


3 It's easiest to apply TWIN-TILE or PANEL-TILE with a trigger-type stapler, although they may be nailed, if you wish. Staple across furring strips and use stapler to hold tile in place while fastening. QUIETONE tiles may be applied in the same way.

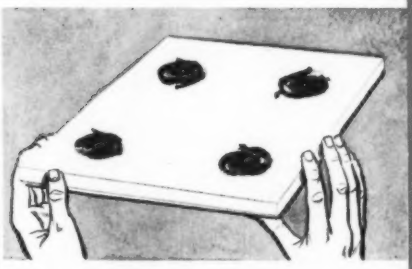


4 Five staples or nails must be used for each tile, as shown above. Tiles are made with an exclusive Kwik-Lok joint, making it easy to fit all joints snugly. Check joint alignment in both directions before driving the first staple. If you use nails, drive them straight in; don't toe-nail. To complete ceiling, measure final tiles carefully and cut with hand saw to insure neat, even fit.

Ceiling Tile



2 Start at a corner. Apply border course of tile with nailing flanges facing out from walls so both flanges are accessible for nailing or stapling. Face nail or staple border courses. Apply tile either at right angles or parallel to furring.



5 ADHESIVE APPLICATION of 12" x 12" QUIETONE, TWIN-TILE and PANEL-TILE is approved if ceiling surfaces are sound, true, dry and free from dirt and grease. Work adhesive into back of board in spots about 2" wide. Apply more adhesive to same areas; build up thickness of about 3/8". Spot adhesive at corners and along edges 8" to 10" apart. Place tile lightly against ceiling and slip into place alongside adjacent tile, gradually increasing pressure.

WHERE *to get everything you need*

There is a U.S.G. building materials dealer in your neighborhood. He is ready with all the supplies you'll need to build beautiful walls and ceilings. He will be glad to answer your questions. He can even furnish you with plans and ideas.

WHY *insist on U.S.G. products*

Why not have the *best*—quality building materials that give you greater value for your money, brought to you through the well-known research and product development facilities of U.S.G.

United States Gypsum

The greatest name in building

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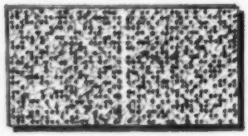
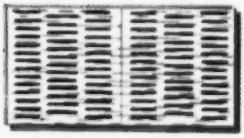
choose from these smart new

FASHION TILES

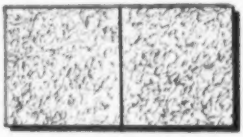
for ceilings



Perforated QUIETONE* in Random Line design, Coppertint color.



Slotted QUIETONE in Rib Line design, Pewter Gray color.

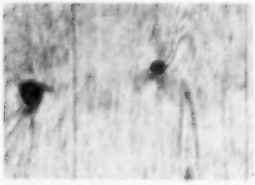


Insulating TWIN-TILE in Random Line design, Coppertint color.

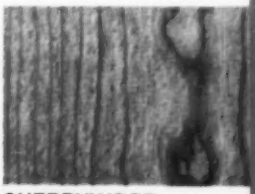
four beautiful finishes in . . .

SHEETROCK* WALLBOARD

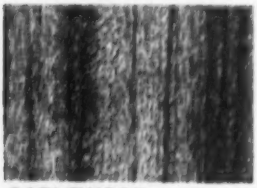
*T. M. REG. U. S. PATENT OFFICE



RANCH PINE
Available in regular and Panel SHEETROCK.



CHERRYWOOD
Available in regular SHEETROCK.

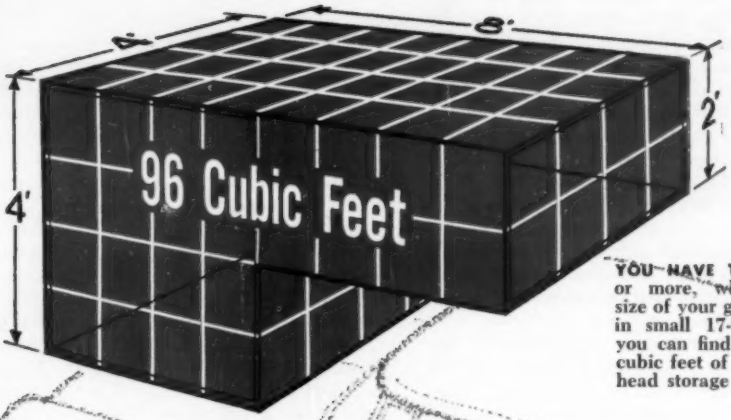


SABLEWOOD
Available in regular SHEETROCK.

STRIATED
Available in Panel SHEETROCK only.

Tear This Out for Handy Reference

To remove this booklet, place your left hand on the facing magazine page, grasp the booklet with your right, and pull it gently away.
After reading, file for future reference. You'll find it valuable on many home jobs.



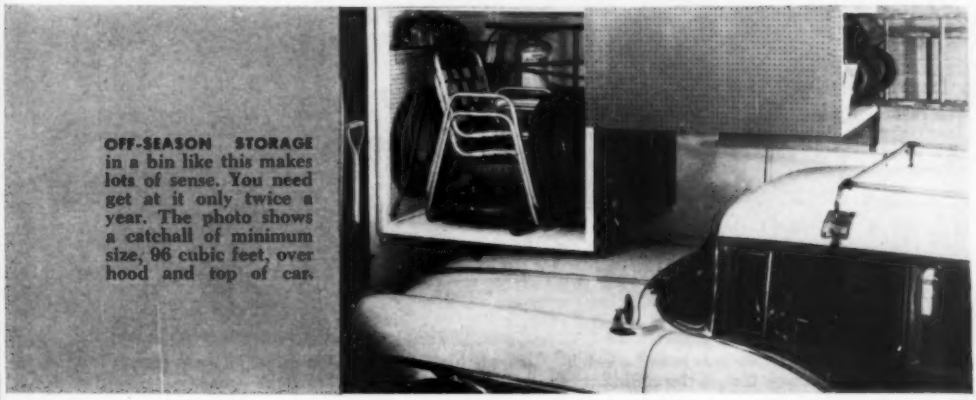
YOU HAVE THIS SPACE, or more, whatever the size of your garage. Even in small 17-foot garage you can find at least 96 cubic feet of handy overhead storage space.

Garage Catchall
...a problem solver for everyone

PS Home Improvement Plan 3

CHRONIC garage clutter induced by off-season storage gets a quick cure with this catchall bin. By making use of waste space above the car, in effect it enlarges the garage.

The big storage bin fits above the hood and back over the car to the garage-



OFF-SEASON STORAGE in a bin like this makes lots of sense. You need get at it only twice a year. The photo shows a catchall of minimum size, 96 cubic feet, over hood and top of car.

CONTINUED

door track. Here you can find 96 cubic feet of storage area even in the smallest garage—one 17′ long with an 8′ ceiling.

This isn't easily accessible space, but it's made to order for seasonal stuff. In the fall, your lawn chairs, sports gear, screens and garden equipment disappear inside its sturdy, covered frame—out of the way and out of the weather. Next spring, it'll handle summer storage of storm sash, snow tires, and sleds.

The perforated skin provides storage space, too. On it you can hang a small stepladder or tools that are used through all the seasons.

With the car in the garage, check the space against dimensions given in the plans, and don't be greedy. Leave generous clearances over the hood and top of the car, and in front of the windshield to allow for a bouncy stop. If the car-radio antenna is on the right side, check its height in the down position and figure it in your plans. On the left side, the antenna is safe, since the catchall doesn't cover the full width of the car (to provide head clearance when you step out).

Consider the garage light, too. If its location seriously shortens the over-the-car portion of the catchall, you'll have to move it, perhaps under the bin.

Begin the frame by joining the top 2″-by-2″ stringers and cross members. Because of its L shape, the catchall had best be built upside down. This way its top can lie flat on the floor. Add the uprights, joining them to the stringers with paired 3″ #12 wood screws offset just enough to clear each other at right angles.

When completed, the frame may appear flimsy for all you plan to store in it. But the secret of its great strength lies in the airplane-type construction—light framing and stressed skin. The skin of the catchall is a sheet of ¼″ tempered hardboard. The perforated type is used on the sides to provide holes for wire hangers. The bottom skin is smooth unperforated hardboard for easy sliding of items stored out of easy reach. Fasten the hardboard to the frame with 1″ #12 roundhead wood screws, spacing them four to six inches apart for maximum load distribution. Drive screws through to intermediate uprights as well as at the ends of the panels to add to the overall rigidity. Space deck screws 6″ apart.

Spike 2″-by-4″ cleats to the wall studs to support the end and side of the catchall. You are then ready to attach the bin permanently to the ceiling joists. Drill through the outer top stringer and cross members for ¼″-by-3½″ lag bolts. A washer under each bolt head will keep it from chewing into the wood. Drive lag bolts through the lower stringers into the wall studs for extra rigidity.

IN A 20-FOOT GARAGE, you can install a catchall of this size, 120 cubic feet, if the ceiling is at least 8′ high. Stressed-skin principle gives heavy-load carrying capacity to light frame.

CONTINUED

Porter-Cable CIRCULAR SAWS have *Power-Plus Accuracy!*

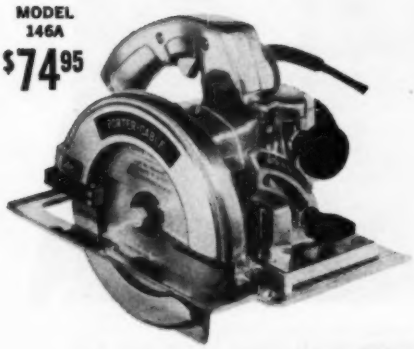
This 6½" Saw is loaded with many of the exclusive features found on Porter-Cable professional models. You can make every possible cut, including 45° angles on 2 x 4's! Has instant depth and bevel adjustments . . . self-lubricating bearings . . . weighs only 8½ lbs.

A 3-STAR TOOL

Safety Kickproof Clutch
"No-Drag" Telescoping Guard
Cuts 2 x 4's at 45°

MODEL 66 **Only $39.95**

MODEL 146A
$74.95



6½" Heavy-Duty Porter-Cable Saw. Here is a professional saw at a low price. It's light in weight yet a powerhouse. Carpenters pick this model every time for speed and accuracy of cut!

A 5-STAR TOOL

- ★ Ball bearings throughout
- ★ Exclusive gear lubricator
- ★ Safety Kickproof Clutch
- ★ Blower Clears Line as Cut
- ★ Calibrated Depth, Bevel Sets

Limited offer! Order your saw now!
Send no money! Take 6 months to pay!

Porter-Cable
Quality Power Tools

PORTER-CABLE MACHINE COMPANY
9159 Marcellus Street, Syracuse 4, N. Y.

Porter-Cable Machine Co., 9159 **Marcellus Street**
Syracuse 4, N. Y.

I wish to order the tools checked below. I agree to pay my Porter-Cable Dealer full price or down payment indicated upon receipt of tool, and the balance in monthly installments shown below.

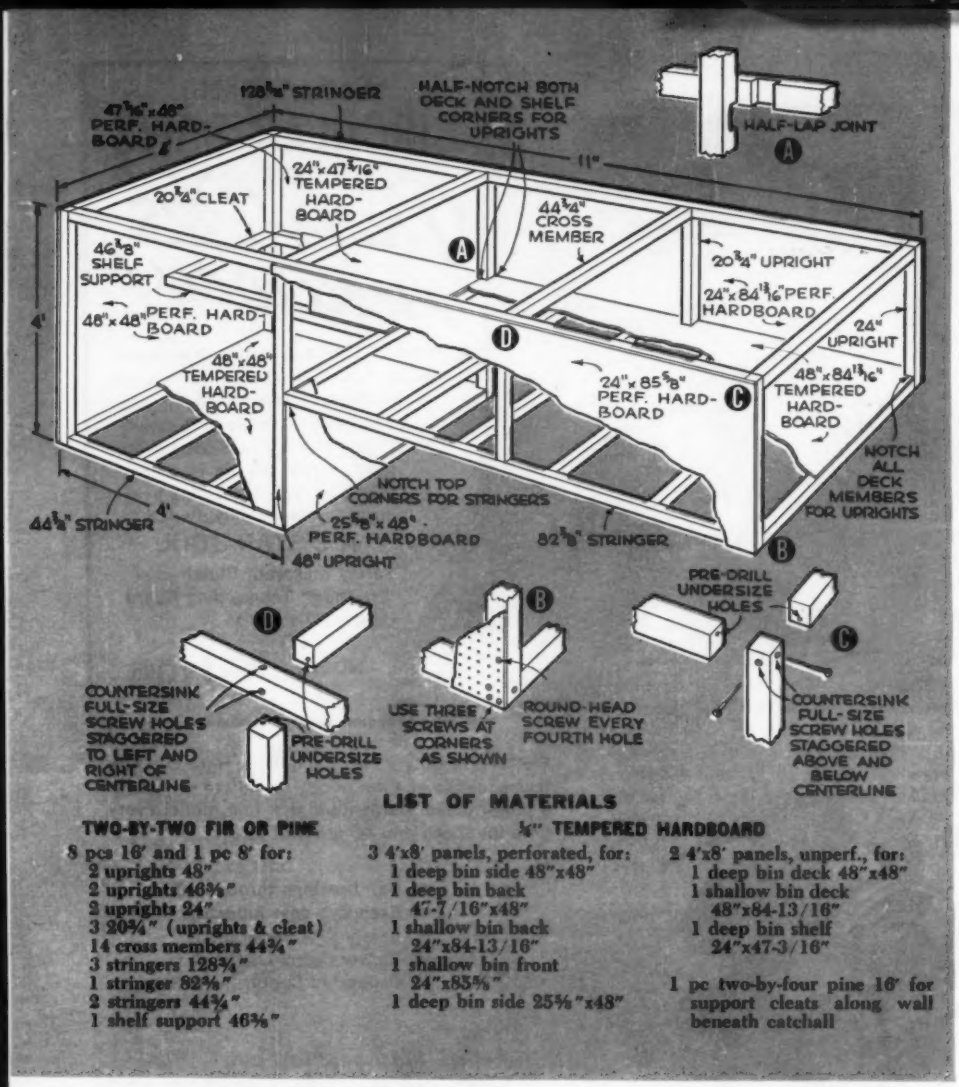
	Price	Down Payment	Balance Monthly for 6 months
Model 66 Saw	$39.95	$9.00	$5.50*
Model 146A Saw	$74.95	$18.75	$9.95*

*includes service charge

Name_____

Address_____

City & State_____



LIST OF MATERIALS

TWO-BY-TWO FIR OR PINE

8 pcs 16' and 1 pc 8' for:
- 2 uprights 48"
- 2 uprights 46⅜"
- 2 uprights 24"
- 3 20¾" (uprights & cleat)
- 14 cross members 44¾"
- 3 stringers 128¾"
- 1 stringer 82⅝"
- 2 stringers 44¾"
- 1 shelf support 46⅜"

¼" TEMPERED HARDBOARD

3 4'x8' panels, perforated, for:
- 1 deep bin side 48"x48"
- 1 deep bin back 47-7/16"x48"
- 1 shallow bin back 24"x84-13/16"
- 1 shallow bin front 24"x85⅝"
- 1 deep bin side 25⅝"x48"

2 4'x8' panels, unperf., for:
- 1 deep bin deck 48"x48"
- 1 shallow bin deck 48"x84-13/16"
- 1 deep bin shelf 24"x47-3/16"

1 pc two-by-four pine 16' for support cleats along wall beneath catchall

The sketch above gives dimensions for a catchall in an average 20-foot garage with an 8' ceiling. For a higher ceiling, adjust the vertical dimensions upward to use the extra space. As shown, the catchall has no top covering since it's designed for attachment directly to ceiling or joists. If a top surface is desired, use ¼" tempered hardboard and install 2"-by-2" cross members spaced about 15" apart.

If you plan to store extra-heavy loads in the bin, you may want to consider beefing it up. Here's how: Apply flat corner braces to all frame joints *over* the hardboard with screws passing through both into the stringers. Then run joist-supported metal strapping under the shallow section of the bin.

THE MASONITE CORPORATION has added this garage catchall storage bin to its list of project plans. If you like the convenience of working with separate plans, send a postcard asking for the free garage catchall plans. Address: Masonite Home Service Bureau, 111 W. Washington Street, Chicago 2, Ill.

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the things you've always wanted!

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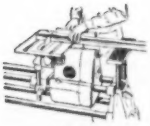
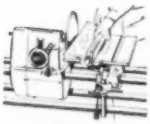
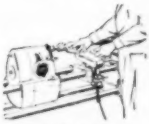


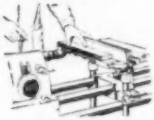
9" Saw



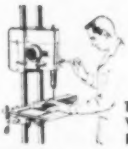
12" Sander



34" Lathe



Unlimited Horizontal Drill



16½" Vertical Drill Press

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A Subsidiary of
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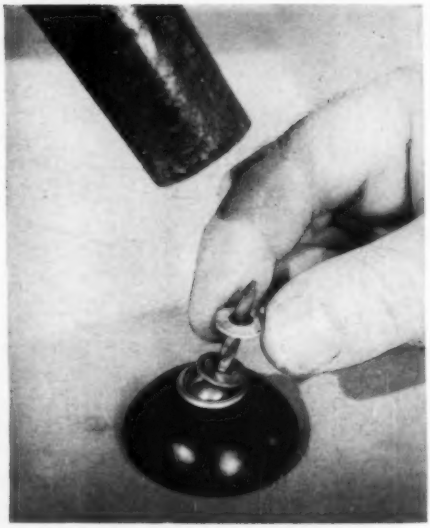
Shrink Dowels for Best Fit

IF DOWELS are too snug, shrink them a bit an hour before use by warming them on a bottom-up iron at low heat; or put them in a box with a lighted bulb. Then they'll slide home easily, later expanding to a tight fit as they absorb glue.



Washers Level Furniture

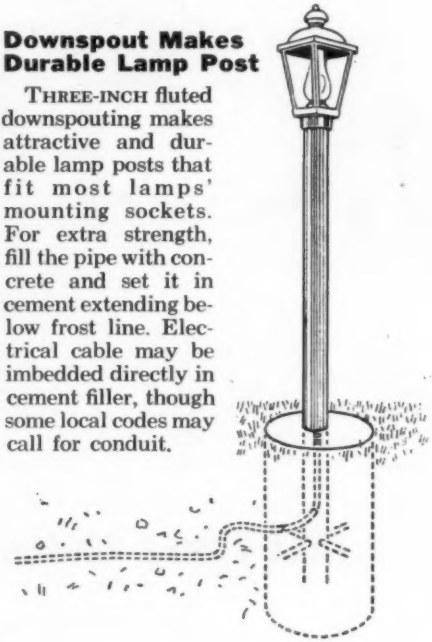
WHEN a chair or table fitted with furniture rests of plastic develops wobble from a short leg, level it the easy way. Just remove the furniture rest—it pulls out—and slip a small washer or two over the nail before replacing it.

Pipe Holds Garbage Cans

THIS garbage-can holder keeps cans from being tipped by animals, children, or wind. By keeping cans off the ground, it prevents rusting. The stand is made of one-inch pipe, embedded in concrete. Heavy steel strap bolted to the pipe makes hook for handle, keeps cans from swinging. Covers can be attached to the pipe with a short piece of light chain.

Downspout Makes Durable Lamp Post

THREE-INCH fluted downspouting makes attractive and durable lamp posts that fit most lamps' mounting sockets. For extra strength, fill the pipe with concrete and set it in cement extending below frost line. Electrical cable may be imbedded directly in cement filler, though some local codes may call for conduit.



The NEW F-57 HAMMER with IMPROVED *light-weight* CONSTRUCTION

NON-BREAKABLE FIBER-GLASS HANDLE

Stronger than Steel -with the Hickory feel

You'll marvel at the free and easy swing of the most perfectly balanced hand tools ever made. These are two of the 28 tools with non-breakable fiber-glass handles in the new Plumb line.

At last. Here's the only handle that won't bend out of shape or collapse — can't rust, rot or corrode. Guaranteed non-breakable in normal use.

BALL PEIN MACHINISTS' HAMMER

FM24. 24 oz. head —

$5.00

Advertised Consumer Price

NEOPRENE COVERED GRIP

Shock absorbent and Slip-Proof. Resists grease, oil and sweat.

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New Functional head design gives added driving power.

Handle withstands overstriking without breaking. Also available in 16, 20, 32, and 40 oz. head weights.

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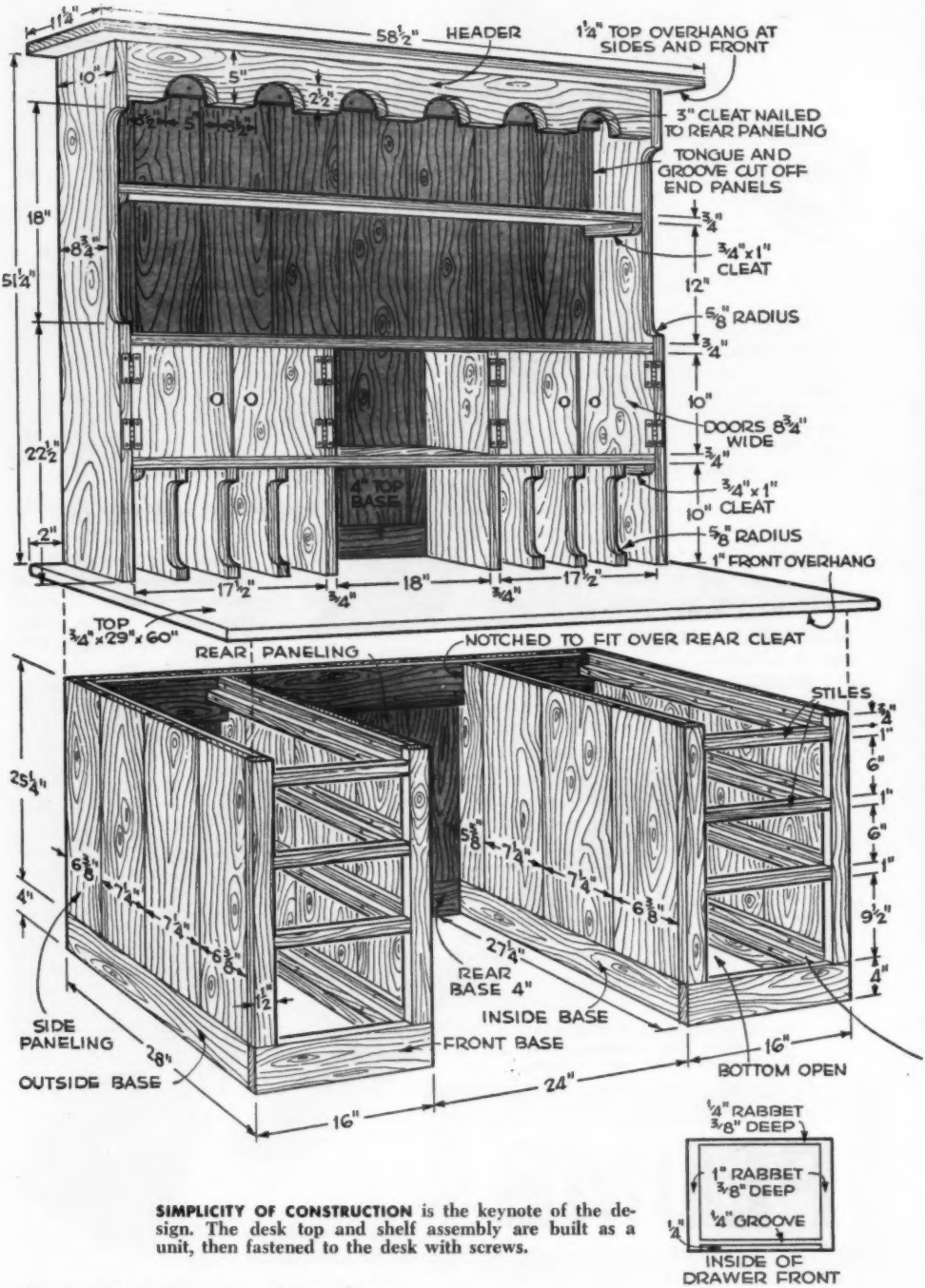
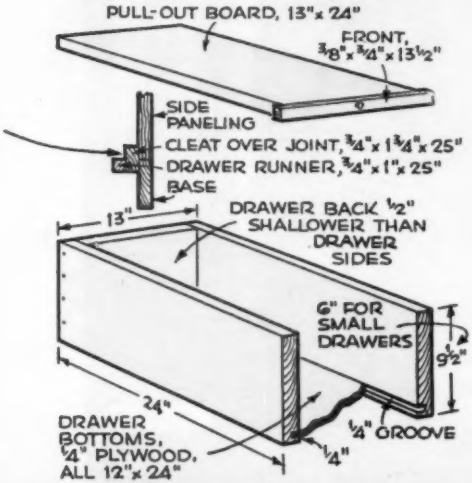


SIMPLICITY OF CONSTRUCTION is the keynote of the design. The desk top and shelf assembly are built as a unit, then fastened to the desk with screws.

HOW TO BUILD A Bookshelf Desk

PS Home Improvement Plan 4

SHOWN DISPLAYING CHINA, this handsome piece of furniture has room for a small library, too. Two partitions are enclosed with doors for out-of-sight storage of writing materials.



CLEATS and nails hold this massive bookshelf desk together. There isn't a single cabinetmaker's joint in it. The illusion of fine craftsmanship is created by the slip-together tongue-and-groove paneling used on the sides and back.

The bookshelf desk was designed with ease of construction and flexibility in mind. Its styling will fit several furniture periods. It can be built as a free-standing unit, or as a built-in to fill an

LIST OF MATERIALS

1" lumber (3/4" actual thickness):

UPPER PART

2 pcs 10"x51 1/4" sides
8 pcs 1"x8" paneling, 47 1/4" rear panel
1 pc 11 1/4"x58 1/2" top
1 pc 8"x54 1/2" upper shelf
2 pcs 9 1/4"x54 1/2" lower shelves
10 pcs 9 1/4"x10" dividers
1 pc 5"x54 1/2" header
1 pc 3"x54 1/2" rear-panel cleat
1 pc 4"x54 1/2" base for rear panel
4 pcs 8 3/4"x10" doors
2 pcs 1"x7 3/4" cleats upper shelf
4 pcs 1"x8 1/4" cleats for lower shelves

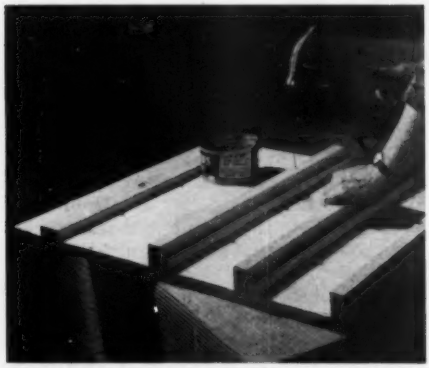
LOWER PART

24 pcs 1"x8" paneling, 25 1/4" sides and rear
16 pcs 1 3/4"x25" cleats
16 pcs 1"x25" drawer runners
2 pcs 4"x27 1/4" outside bases
2 pcs 4"x26 1/2" inside bases
2 pcs 4"x16" front bases
1 pc 4"x54 1/2" rear base
1 pc 4"x54 1/2" rear nailing cleat
4 pcs 1 1/2"x25 1/4" vertical stiles
6 pcs 1"x13" drawer stiles
5 pcs 1"x8" paneling 60" desk top
4 pcs 9 1/2"x24" large-drawer sides
8 pcs 6"x24" small-drawer sides
2 pcs 9 3/4"x13 1/2" large-drawer fronts
4 pcs 6 1/4"x13 1/2" small-drawer fronts
2 pcs 9"x11 1/2" large-drawer backs
4 pcs 5 1/2"x11 1/2" small-drawer backs
2 pcs 13"x24" pull-out boards
2 pcs 3/8"x3/4"x13 1/2" board fronts

MISCELLANEOUS

6 pcs 12"x24"x1/4" ply. drawer bots.
8 3" forged-iron H-hinges
6 5" forged-iron drawer pulls
6 7/8" diam. forged-iron pull knobs
1 lb. 2" finishing nails
8 2 1/2" #12 flat-head wood screws

alcove or to complement a paneled room. If it is built into a paneled room, the rear paneling, of course, can be omitted by building the sides out from the paneled wall.



CLEATS SERVE TWO PURPOSES: They hold the side paneling together and fasten it to the base strip; they serve as guides for the drawers and hold the runners in position.

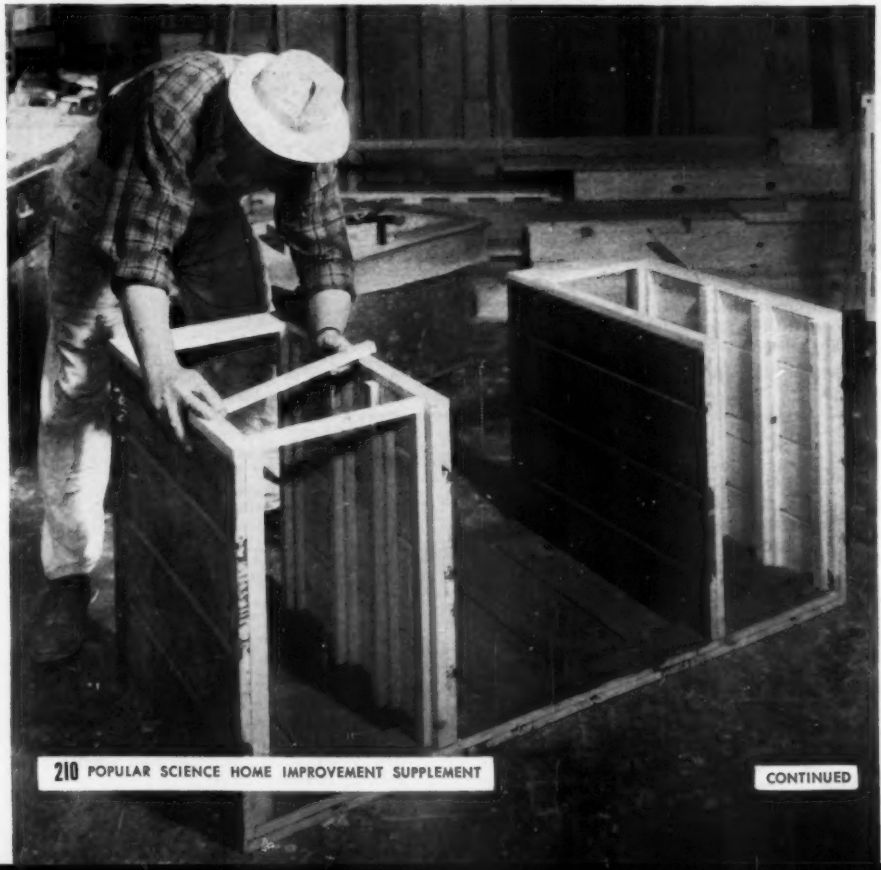
Sizes of all parts are listed for you—so begin by buying and cutting your lumber.

You might use any of 10 species of Western-Pine-region lumber: ponderosa pine, Idaho white pine, sugar pine, lodgepole pine, incense cedar, inland red cedar, Engelmann spruce, Douglas fir, white fir and larch. All are easy to work and accept any finish. The differences are in grain and color.

Think about the finish before you start. If you plan a natural finish, there's no problem. But if you want to darken the wood, prestain the tongue-and-groove boards before assembly. This insures uniform coverage and eliminates bare wood or accumulated stain in hard-to-reach places.

Assemble the four sides of the two desk-drawer sections. Choose matching lengths of 1″-by-8″ tongue-and-groove paneling for each side and fasten them together over 4″ baseboards with 1″-by-2″

CROSS STILES BETWEEN DRAWERS separate the drawer openings and tie the sides of the desk sections together. Note that the paneling has been stained before assembly.



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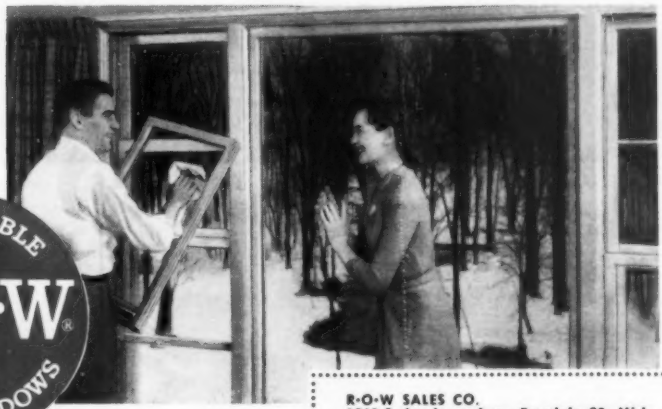
Removable Wood Windows are a "must" for modern, functional homes. R•O•W Windows are pressure-snug during all seasons. They are built better to last longer.

Wood windows provide greatly superior insulation against outside temperature extremes. The finest removable wood windows are identified by this emblem.



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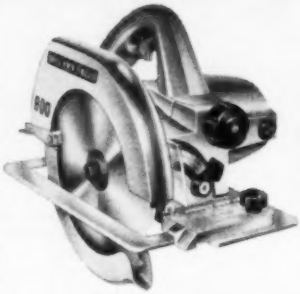

800 Heavy Duty
8¼" · 2.0 HP · $95.00

A Contractor's Special that's a real standout. Tremendous power and cutting capacity.

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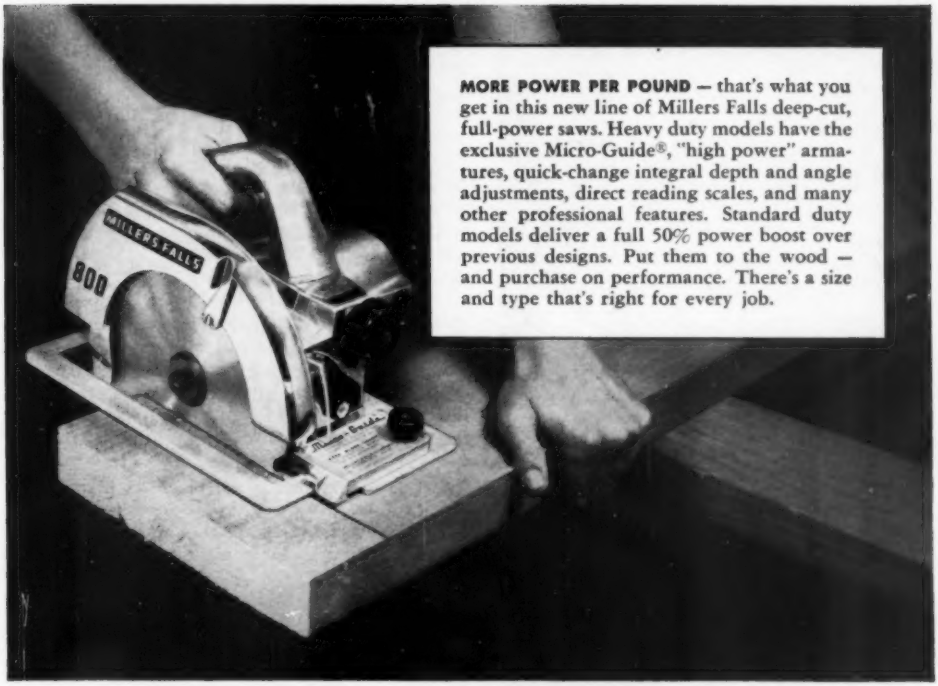
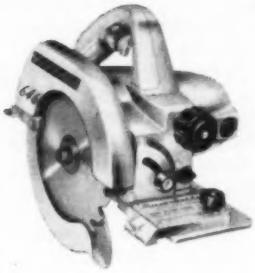
An outstanding Builder's Buy, ideal for every type of work. Lightweight, easy to handle.



MORE POWER PER POUND — that's what you get in this new line of Millers Falls deep-cut, full-power saws. Heavy duty models have the exclusive Micro-Guide®, "high power" armatures, quick-change integral depth and angle adjustments, direct reading scales, and many other professional features. Standard duty models deliver a full 50% power boost over previous designs. Put them to the wood — and purchase on performance. There's a size and type that's right for every job.

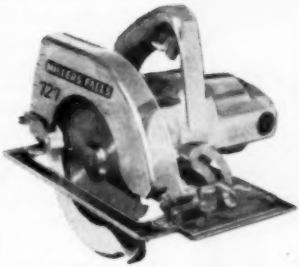
have it IN SPADES!



646 Heavy Duty

6½" · 1.5 HP · $69.50

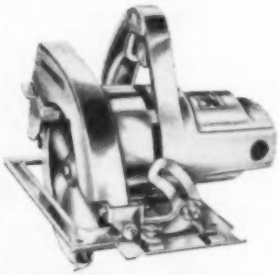
An amazing all-purpose performer. Special base permits sawing in very close quarters.



727 Standard Duty

7" · 1.5 HP · $74.50

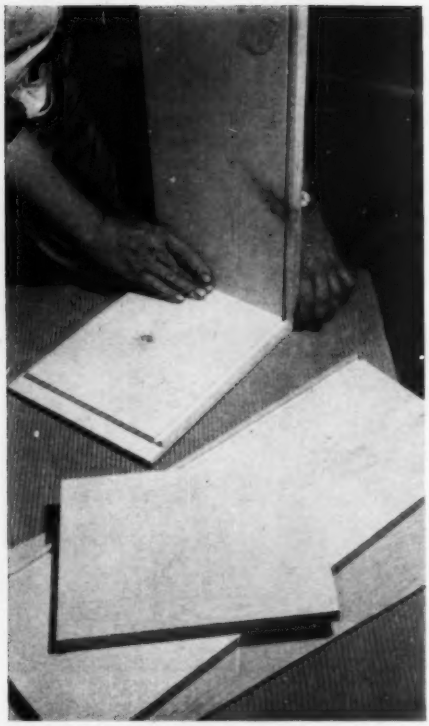
A rugged Carpenter's Model with ample capacity as well as perfect, easy-to-use balance.



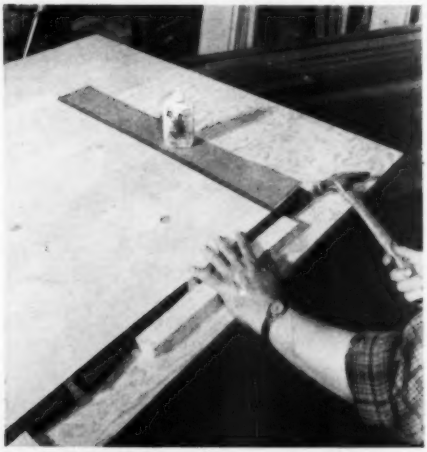
626 Standard Duty

6½" · 1.0 HP · $54.50

Swings through every common cut including tough compound mitres in 2-in. dressed lumber.



RABBETS CUT IN DRAWER FACE make nailing side pieces easier, and provide ¼" overlap around drawer opening at sides and bottom. Grooves are for ¼"-plywood drawer bottom.



SOLID DESK TOP is made by cutting tongue-and-groove edges off five lengths of paneling and edge-gluing. Wedges driven behind strips nailed to the workbench tighten joints.

cleats. Nail the cleats across the inside of the paneling as the joints are pulled, wedged or clamped tightly together. Locate the cleats according to dimensions and nail the drawer runners over them.

Join the rear desk paneling together in a similar manner. This paneling must fit snug against the wall, though, so the nailing cleat should be placed on the face, along the top edge. Toenail the bottom ends of the paneling to the 4" base.

Cut the four sides and rear paneling to their overall dimensions. This removes the tongue from one outer edge and the groove from the other. Notch the top rear corner of the two inner sides to fit over the rear nailing cleat. Join the sides to the back with 2" finishing nails driven through the rear paneling.

Nail the front base strips and vertical stiles to the front edge of the sides, then nail the cross stiles to the ends of the drawer runners to complete the desk structure.

Make two pull-out boards, four 6" drawers and two 9" drawers as shown. Lightly plane them after assembly, if necessary, to make them slide easily on the runners. Drill holes for pulls.

Rip the tongue and groove off five 60" lengths of paneling and edge-glue them together to make the desk top. Squeeze the boards tightly together in a jig made by nailing wood strips to a table top or piece of plywood. Drive wedges between the strips and the boards to force the joints together. When dry, trim the top square and to size, and round off the front and side edges.

Fasten the bookshelf sides in place by nailing through from the underside of the desk top. Bridge the sides with the shelf top, driving nails through the shelf top from above. Nail a temporary board diagonally across the sides and shelf top to hold the parts square. Nail the top base in place between the sides.

Nail the lower-shelf pigeon-hole dividers in position. (Drive nails through the desk top into their bottom edges, through the first shelf into the top edges.)

Carefully toenail the two dividers that will support the doors onto the first shelf, place the second shelf over them and drive nails through the shelf into the top edge of the dividers. Anchor the ends of this shelf to the sides with cleats. In-

CONTINUED

DU PONT

PAINT NEWS

NEW DU PONT LUCITE ACRYLIC HOUSE PAINT

TRADEMARK

LASTS 50% LONGER

DRIES IN 30 MINUTES

Here's the greatest paint discovery since Du Pont quick-drying auto finishes: Du Pont "Lucite" Acrylic House Paint. It's so durable it lasts 50% longer than ordinary paints . . . can save you hundreds in repainting costs. An acrylic emulsion, it is recommended for use only over No. 38 Blister Resistant Wood Primer on new wood or on old surfaces with the finish completely removed.

SOLVES BLISTERING PROBLEM

For a long time blistering has been home owners' most serious paint problem. Until now, it has been an almost insolvable, recurring predicament. The combination of No. 38 Primer and "Lucite" Acrylic House Paint can give unprecedented protection against blistering because it is chemically engineered to allow moisture vapor to breathe through while shutting out water penetration.

EASIEST PAINT TO APPLY

"Lucite" Acrylic House Paint flows on more smoothly and evenly than any paint you ever used. It dries in 30 minutes and it's ready for a second coat in one hour! Thus you can save a lot of time and money by avoiding a great deal of ladder shifting that is usually necessary. One coat covers, two give maximum protection and durability. Water is all you need for thinning. And it's so easy to clean up . . . fresh paint spots wipe off with a damp cloth. Soap and water clean your brushes. This amazing new paint and primer are now ready for immediate delivery at your Du Pont Paint Dealer's. You'll find his name in the Yellow Pages of your phone book.

Buy the paint that's worth the work! Your time is too valuable to risk on "bargain" paints. Buy Du Pont Paint and you know you're getting the most modern finishes made . . . and that the beauty will last. Du Pont Paint Chemistry assures you of that.

DU PONT

Better Things for Better Living
. . . through Chemistry

stall the top shelf on cleats nailed to the sides.

To make the header, cut the scallops with a jig or coping saw and sand them smooth. Nail the header in position.

Use a 3″ nailing cleat across the top of the rear bookshelf panel to join the T&G boards. Remove the temporary brace and set the panel in place. Drive nails through from behind into the shelves and toenail the bottom edges of the boards to the base strip from behind.

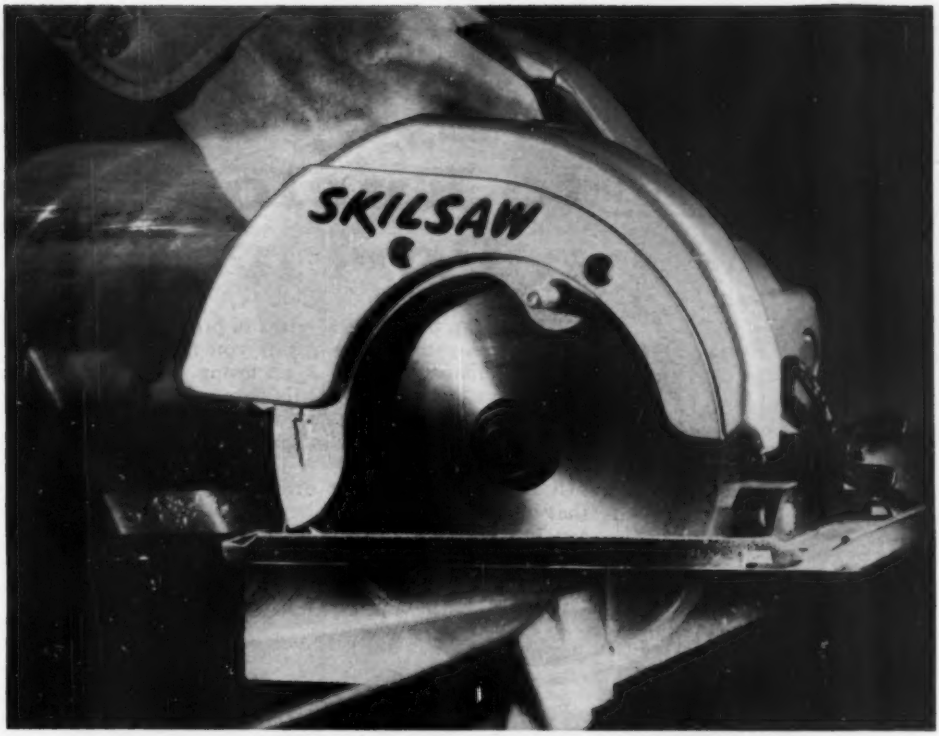
Fasten the desk top to the desk with screws driven through holes drilled in the top cleat on each paneled side.

Hang the doors to check their fit, but remove the H hinges before you do the final finishing.

If you've prestained the paneling, stain the other parts of the desk with the same material. When dry, apply the final coat of wax or a clear finish. Shellac, Satinlac, clear lacquer or Minwax are all good.

THE WESTERN PINE ASSOCIATION has now added this bookshelf desk to its list of plans. If you like the convenience of working from a separate plan that lies flat on your bench, write for a free bookshelf-desk plan. The address: Western Pine Association, Yeon Bldg., Portland 4, Ore.

NAILS ARE USED THROUGHOUT the assembly. Those that can't be concealed by nailing from behind or by toenailing are set first and then covered with wood filler before finishing.



EXTRA POWER, SPEED, ACCURACY!

Skilsaw 6½" Power Saw has rugged 1+ h. p. motor, built-in safety clutch. Cuts 2" boards at 45°.

There are more professional quality features on the Skilsaw Model 536 than any other saw in its price class. Yet, because of Skil's ever-increasing production, you can now own this versatile saw at a new low price—only $49.95. Special features like its non-binding lower blade guard and Vari-Torque, which disengages the blade if it jams or binds, makes it the safest saw to use. Then add these other top features—easy to adjust depth and bevel controls for accurate 45° to 90° cuts, plus a powerful motor rated at over 1 horsepower—and you have your best buy in power saws.

FREE! $5.45 Value

extra blade and rip guide with 6½" Model 536 (illustrated). Hurry! Limited time offer.

NEW, LOW-COST ¼" DRILL. The Skil ¼" Model 503 is your biggest drill value. Extra power from big 2.5 amp motor to drive new Skil Snap/Lock Sander, Jig Saw, 5" Circular Saw and Hedge Trimmer that snap on or off drill in 3 seconds. Only $16.95.

PROFESSIONAL-TYPE SANDER. Over 25 sq. inches of sanding surface to quickly smooth down large areas. Use it to sand wood, wall board, plaster or remove paint and varnish. End sanding boredom and get professional results on every job. Only $49.95.

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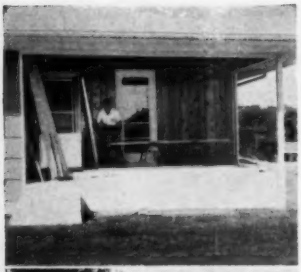

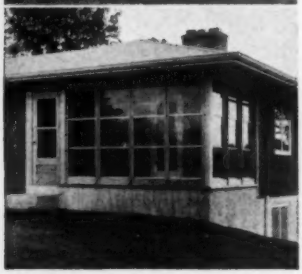

AN OPEN PORCH becomes a year-round room when you use new prefab window units (above). The units, which you just nail together (below), combine three sliding windows, screens and provision for storm sash. Heating and wiring fit in the base.

A Modern Way to Enclose a Porch

YOU can buy walls of glass in prefab units and nail together as many as you need. In this ingenious system for enclosing porches and breezeways, called GlassWalls, you get the modern effect of solid glass from floor to ceiling, yet you can open the windows in summer and close them up tight in winter.

Each window panel is divided into three panes that move in separate, full-length metal tracks. You can stack the panes behind each other, leaving as much as two-thirds of each panel completely open. Or you can vary ventilation by sliding them any-

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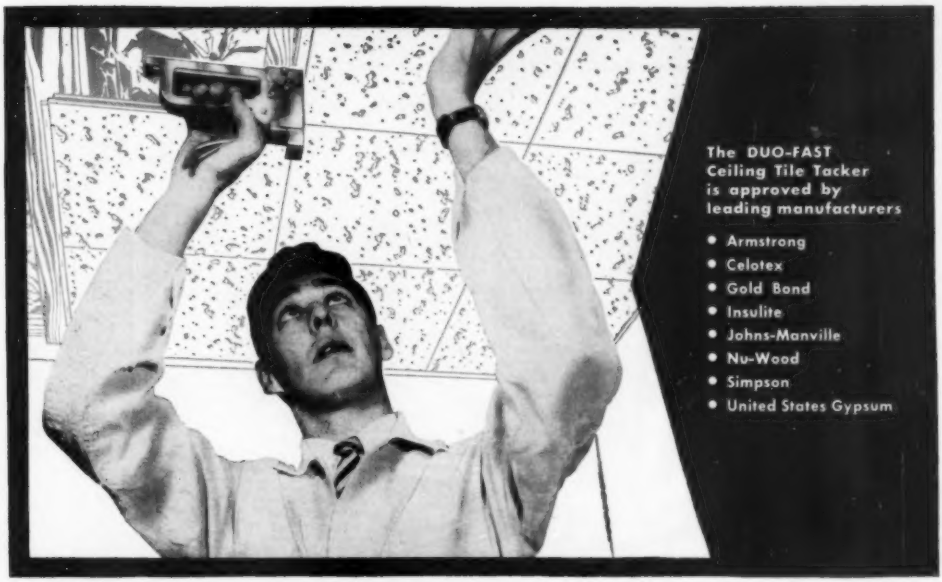
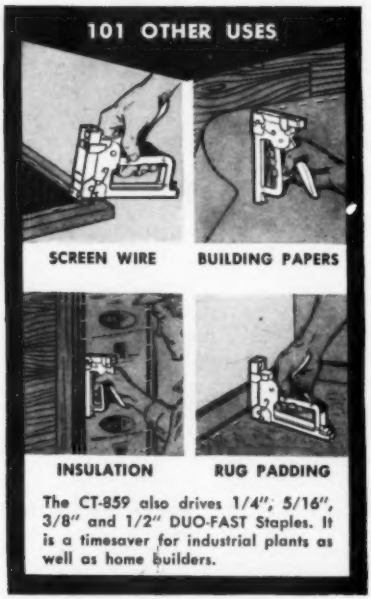


For a professional job, the easy way . . . use the DUO-FAST Ceiling Tile Tacker



Fast, easy, one-hand operation

It's the automatic tacker that makes a ceiling tile expert out of everyone. Power-packed, the DUO-FAST CT-859 drives 9/16", rosin-coated staples required for the job.

Just position the tacker, and compress the handle. The tight-gripping staple is driven right where you want it. No unsightly hammer marks . . . no broken edges on the tile. And you always have a free hand to hold the ceiling tile in position.

The DUO-FAST CT-859 is made for the ceiling tile job . . . widely used by professional builders, and perfect for do-it-yourselfers.

Mail the coupon below for the complete DUO-FAST story

FASTENER CORPORATION
3762-66 River Road, Franklin Park, Illinois

Without obligation, please send me data on DUO-FAST Tackers for ceiling tile, insulation and other home improvement work. Also send the name of the nearest DUO-FAST Building Material Dealer.

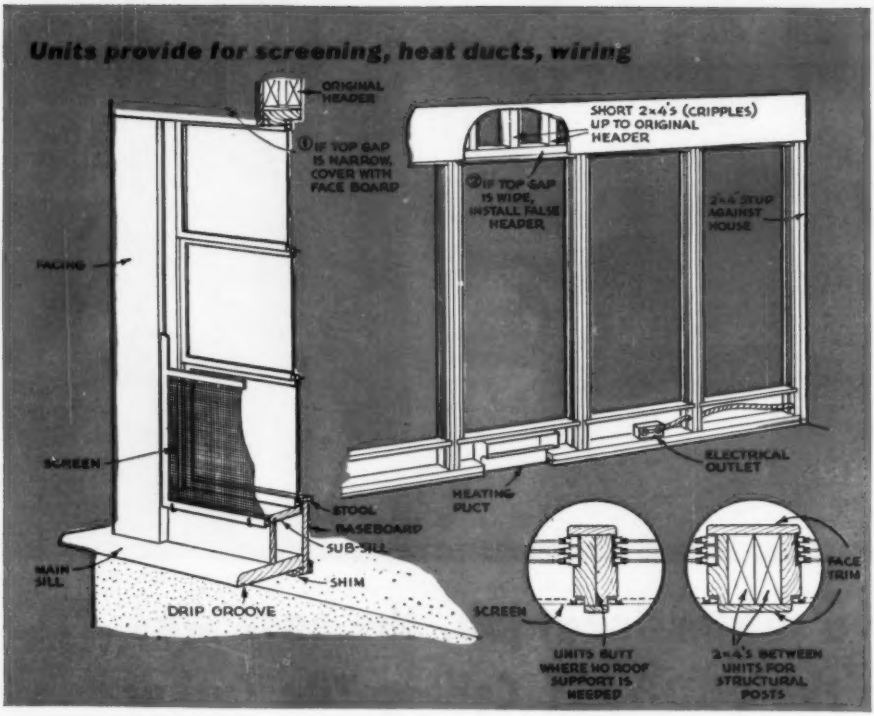
Name_____

Address_____

City_____ Zone____ State_____

My lumber dealer is:_____

9434

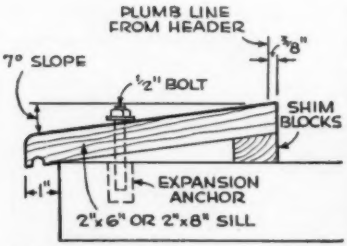


where between the floor and the ceiling.

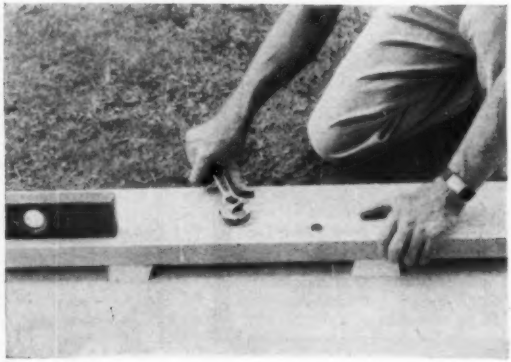
If you stack all panes at the middle, they promote circulation by letting cool air in at the bottom and hot air out at the top. Weatherstripping on all three sliding panes provides a tight seal when the windows are closed in winter. For easy cleaning, the panes slip completely out of the tracks.

Removable full-length fiberglass screens can be replaced in winter with storm sash, giving you a double, insulated wall of glass for greater warmth. Each unit also comes with a built-in hollow base. Arranged in rows, the hollow bases form a continuous channel for running heating ducts and wiring.

What they cost. GlassWalls are sold



SILL IS SLOPED (by shimming or planing to seven degrees) to carry off rain. Window units are precut to match slope and are lined up below header. Sill overhangs foundation, extends ⅜" inside windows.



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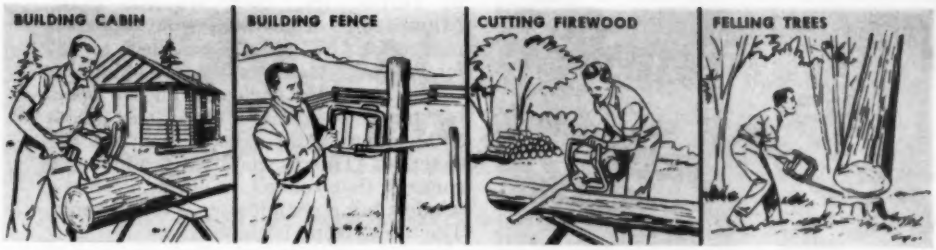

Now You Can Do Any Job, Anywhere, Anytime with One Saw...

NEW EXCLUSIVE WRIGHT® POWER BLADE SAW

No other saw like it! Replaces Chain, Hand, Buck and Crosscut Saws

Fast, powerful, versatile—the Wright Power Blade Saw is all you need to build a cabin, duck blind, boat pier, fence, raft, outdoor furniture. It also prunes trees, cuts firewood ...does any cutting job. Drops 20" trees with a single cut...yet follows a chalkline for precision cutting and leaves a smooth mill-edge. Narrow 3/16" cut.

Gasoline engine starts instantly in any weather, in any position. Safety trigger stops engine instantly, automatically, if saw is dropped. Special Chromeweld Power Blade stays sharper longer. Needs no accessories. And it's so safe anyone can use it.

WORLD'S SAFEST POWER SAW
NO DANGEROUS CHAIN

ONLY **$189.50** Including 20" blade F.O.B. Sheboygan, Wis. Price applies in U.S. only.

THOMAS INDUSTRIES INC.
WRIGHT SAW DIVISION
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Louisville 2, Ky.

Save up to $100 by building a log cabin with the Wright Saw. Send 10¢ for "HOW-TO-DO-IT-PLANS" and booklet "Build the Easy Way With Wright Saw."

MAIL THIS COUPON TODAY!

THOMAS INDUSTRIES INC.
Wright Saw Division
410 S. Third St., Louisville 2, Ky., Dept. PS-9

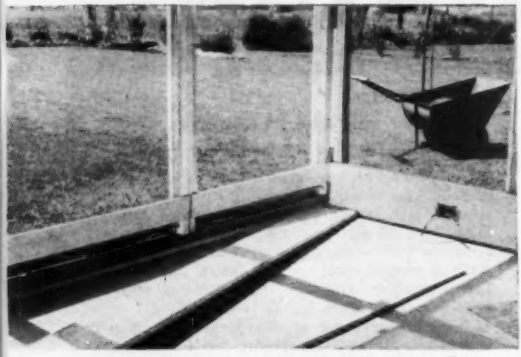
I enclose 10¢ for "HOW-TO-DO-IT-PLANS" and illustrated "Build the Easy Way With Wright Saw" booklet.

Name.....

Address.....

City.....Zone.....State.....

METAL WINDOW TRACKS are ready-mounted in wood frames so they can be easily nailed. Where roof is already self-supporting, units are simply butted and side-nailed together. Structural supports can be provided by leaving enough space to insert posts in between windows.



HOLLOW BASES, OPEN ON ONE SIDE, offer easy access, to run wiring inside. Wall outlets are installed, then a baseboard cover is nailed over the openings. Space inside—about 2¼″ by 4″—is large enough to carry warm-air ducts, finned convectors or other baseboard units.

SMALL GAPS ABOVE WINDOWS can be filled with spacer blocks, as below, then covered with face boards. If gaps are over 6″, false header can be built using short two-by-fours, as shown in main drawing. If too deep a header will block view, it's better to build up from the bottom.

by DeVac, Inc., 5900 Wayzata Blvd., Minneapolis. Individual window panels range from $57 for the smallest to $87 for the largest. Average cost is $70.

The two-sided enclosure on the opening page, using eight units, cost about $800, including labor and a floor over the concrete. This is not cheap until you consider that you get, in effect, not just a window but a complete year-round room. The units, being prefabbed, are also easy to put up yourself, saving you the cost of labor. Where an outside entrance is desired, you substitute a matching prefab door unit for one of the window units.

The only parts not included with each panel are the sill, baseboard and trim strips. These can be bought at local lumber yards or will be supplied by dealers who sell GlassWalls. Typical cost for all extra framing and trim for an enclosure of the type shown is about $50.

How to tell how many you need. GlassWalls come in two standard heights, 69¼″ and 81¼″, and in eight widths from 25⅜″ to 39⅜″ in 2″ steps. Other sizes are available on special order.

Measure the distances between posts on your porch and allow an extra ½″ in each opening for slight irregularities. For best appearance, select the largest window width that will go into each space in exact multiples.

You can intermix two widths if necessary so long as the difference between them is not more than 2″. Arrange the larger units in the center of each opening and balance the narrower ones on the sides. The slight variation in width will be scarcely noticeable. If no combination of sizes will fit exactly, you can cover small gaps with filler strips.

In choosing the right window height, allow at least 2″ for a sill at the bottom. The fit can be adjusted easily by filling in gaps at the top. If you don't need the base for heating or wiring, it can be trimmed off as much as 3″, giving you another way of adjusting height.

DEVAC, INC. has made available separate plans showing the installation of GlassWall window units. If you would like a set of your own to work with and save, it can be obtained free by addressing a request to DeVac, Inc., 5900 Wayzata Blvd., Minneapolis, Minn.

Last, but not least . . . it's the FINISH that counts

If it's an interior wood project, use Deft, the original complete wood finish in one can

EXCLUSIVE SELF-LEVELING FORMULATION

WOOD SELECTION, UNLIMITED

Whatever your project . . . paneling, built-ins, furniture, kitchen cabinets or knick-knacks, there's a wealth of woods and plywoods to select from. Each wood has a beauty all its own, a warmth, a pattern, a light, dark or medium tone. Select the wood, for it's natural charm, then protect and dramatize its beauty with clear Deft Wood Finish, nothing else, from raw wood to bar-top finish.

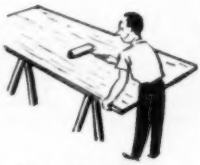
FINISHING, NO LONGER A PROBLEM

Deft is ready to use, no thinning. It is fast dry and completely trouble-free.

PREVENT DARKENING AND WARPING OF NEW WOOD

A fast coat of Deft on raw wood, front, back and edges, guards against darkening and warping. Pencil and crayon marks, grime and fingerprints are easily removed with steel wool while Deft is wet.

PANELING TIME SAVER



Deft-coat panels, back and front before installing. Apply with roller in minutes. When panels are in place, apply an additional coat of Deft.

FINE FURNITURE FINISH

Sand surface to desired smoothness. Apply Deft with brush or roller. Where brushing is difficult, use aerosol spray can. Light-sand first coat, dust with dry brush, then apply additional coats to desired finish. 4/0 steel wool final coat to fine furniture finish. An extra coat or two eliminates need for filler. For high gloss, buff-finish with dry cloth.

NO MORE STICKY DRAWERS AND WINDOWS

Apply Deft to drawer runners and window slides. The more they are used, the smoother the operation.

DEFT-FINISH IN LATHE

Apply Deft to turned wood in lathe. When dry, spin against steel wool for lustrous finish.

ANTIQUE REFINISHING

Deft flow-out action makes antique refinishing easy. Remove old finish, then apply Deft. Use Deft spray can on carved detail.

USE DEFT SPRAY CAN

For fast, effective finishing where brushing is difficult, such as picture frames, shutters, etc.

DEFT, A PROTECTIVE SEALER

Seals door edges against moisture. Seals interior porous stone for easy cleaning. Protects interior brass and metal hardware against tarnish and corrosion. Protects tools against rust.

SIMPLIFIES WOOD FINISHING

Deft is a clear, semi-gloss fast-dry finish. You don't brush it in, simply flow it on. Deft is self-leveling, tightens down to a mirror-smooth finish of unusual beauty. Apply 3 coats the same day. "Misses" can be spotted in and steel-wooled to match perfectly. Get a hand-rubbed finish without hand rubbing. ACCEPT NO SUBSTITUTE.

GOOD TO THE LAST BRUSH FULL

Will not darken or skin in can. A partially filled can of Deft is useable, even after several years on the shelf.

Write for Deft Free 6-step finishing chart.

Deft is available wherever paints are sold.

DESMOND BROS.
1526 W. 228th Street
Torrance, Calif.

Gentlemen: Please send me Deft SS Wood Finishing chart.

Name_____

Address_____

City_____ Zone____ State_____ P.S.

Rumpus Room Pointers

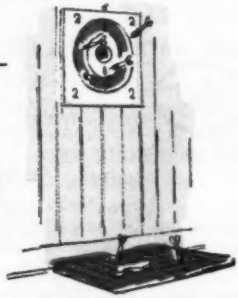
By Ken Murray

PROTECT GAME BOARDS. Printed paper surfaces of game boards soon become scuffed and worn. Protect the entire board while still new by brushing on a smooth coating of thin shellac.

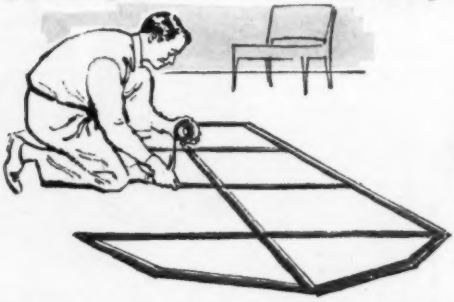
DISPOSABLE ASH TRAYS. Before a party, crumple 12"-by-12" pieces of aluminum foil into balls. Then open out each, forming it into a tray. When full, crumple up and throw away.

GOLF CUPS. You can practice putting shots on the floor by directing the balls into paper cups placed on their sides. Flatten a rolled rim by creasing it with a pencil.

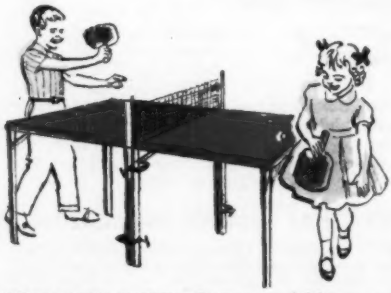
MARBLE RING. For a game of marbles, make a ring on the floor with a piece of garden hose held together with a dowel. The hose keeps marbles from rolling into corners.



DART CATCHER. A fiber door mat placed below the target will keep falling darts from pricking holes in the floor. The thick mat will also keep dart points from becoming dull.



REMOVABLE GAME LAYOUT. Masking tape laid down on tile or linoleum can be removed easily. For color, coat nonsticky side with thin paint. Roll the tape down with a furniture caster.



JUNIOR TABLE TENNIS. Butt two folding card tables together, clamp adjoining legs and you've got it. Clamp two dowel rods to center legs to make projecting posts to support the net.

cuts 4 x 4 at 45°...6" log...fine scroll work...complete safety

½HP WEN SOUPED-UP SABRE SAW

AMAZING—*First* and *only* portable electric saw to give you all these features!

- cuts a 6" board or 6" log yet cuts any pattern, too!
- cuts all metals up to ½" steel and 2" pipe!
- cuts 4x4 at 45° . . . fine pattern work in most any material, including sheet metal and sheet steel!
- does everything a pattern saw will do . . . out-performs a circular saw . . . works as band saw or nibbler, too!
- beautifully balanced, lightweight, smooth-running . . . completely safe!
- makes cuts only a chain saw could—until now!

SPECIFICATIONS:
Motor: 110V 6 amp AC-DC. Length: 8". Width: 7". Height: 7½". Weight: 6 lbs. Powerful ½ H.P. motor delivers 3400 strokes per minute; length of stroke: 1". 3-wire 8 ft. cord with adaptor. Heavy duty roller and oilite bearings. UL listed under industrial classification.

MODEL 909

only **$44.95** complete

Look what you get! rip guide, circle cutter, 45° tilting base plate and 7 blade complement—the right blade for every job!

WEN PRODUCTS, INC.
5810 Northwest Highway, Chicago 31

Exported by: Scheel International, Chicago

Model 505 Power Saw Kit
8 saws in 1! Cuts 2 x 4's, ½" steel, anything! Works as rip saw, jig saw, cross cut, scroll, coping, hack, band and keyhole saw. Cuts any shape, makes own starting hole. Saw Kit with saw, rip guide, circle cutter, 5 blades, **$29.95.**

Sander-Polisners and Kits
Straight-line action for perfect, scratch-free surfaces. Sand wood, metal, plaster patches, etc. Polish car, furniture, any surface. 3 types—fine finishing, general utility, heavy duty. **$13.95 to $19.95**

2-Speed ⅜" Power Drill
Lets you change from 1000 to 3000 rpm to get just the right speed for different jobs. Delivers maximum torque under load. ⅜" Jacobs geared chuck. 35 piece Accessory and Toter Kit. **$9.95. Drill only, $29.95.**

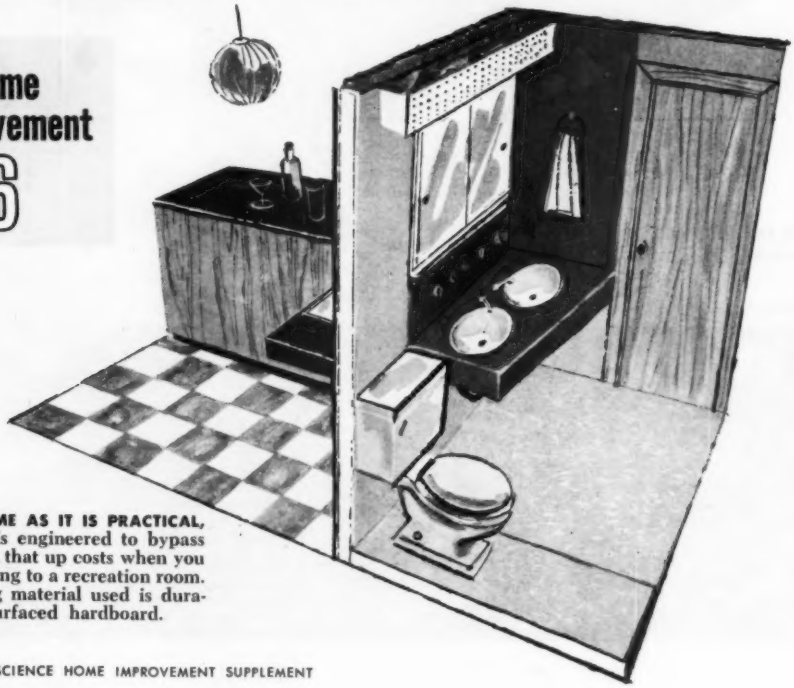
Electronic Soldering Guns
for practically all home soldering jobs. Working hot in 2½ to 5 seconds. Long reach, long life tips, automatic spotlight. 6 models 100 to 250 watts. **$5.95 to $15.95**

On one side—a sink-equipped bar; on the other—a powder room

WITH RUNNING WATER at your elbow, there's no need to lug trays of glasses back to the kitchen for the rinse-and-polish treatment.

TWIN LAVATORIES on the opposite side of the plumbing wall are a popular modern note. Sliding mirrors above hide spacious cabinets.

PS Home Improvement Plan 6

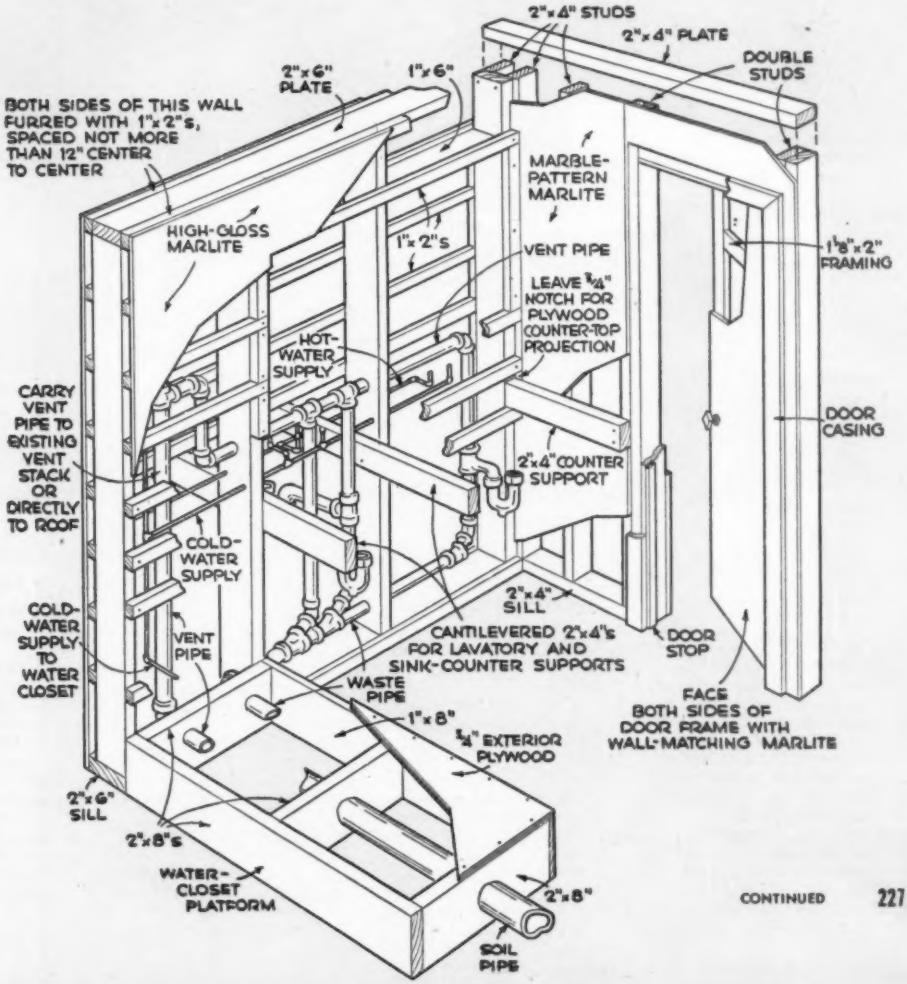


AS HANDSOME AS IT IS PRACTICAL, this project is engineered to bypass the problems that up costs when you bring plumbing to a recreation room. The finishing material used is durable plastic-surfaced hardboard.

Two-Way Plumbing Wall for a Rumpus Room

HERE'S the easy way to add a powder room and sink-equipped bar to your rumpus room. Build a two-way plumbing wall. Place common water-supply lines, and waste and soil pipes inside; then tie the fixtures to the two sides of the wall.

That's the idea behind the attractive bar-and-lavatory layout shown here. The wall pays off as a space-saver, too. Because it carries no structural house load, it offers big pockets for oversize medicine and storage cabinets. It has another nice hideaway feature—a hinged bar that swings around to cover the sink when not in use. In that position the



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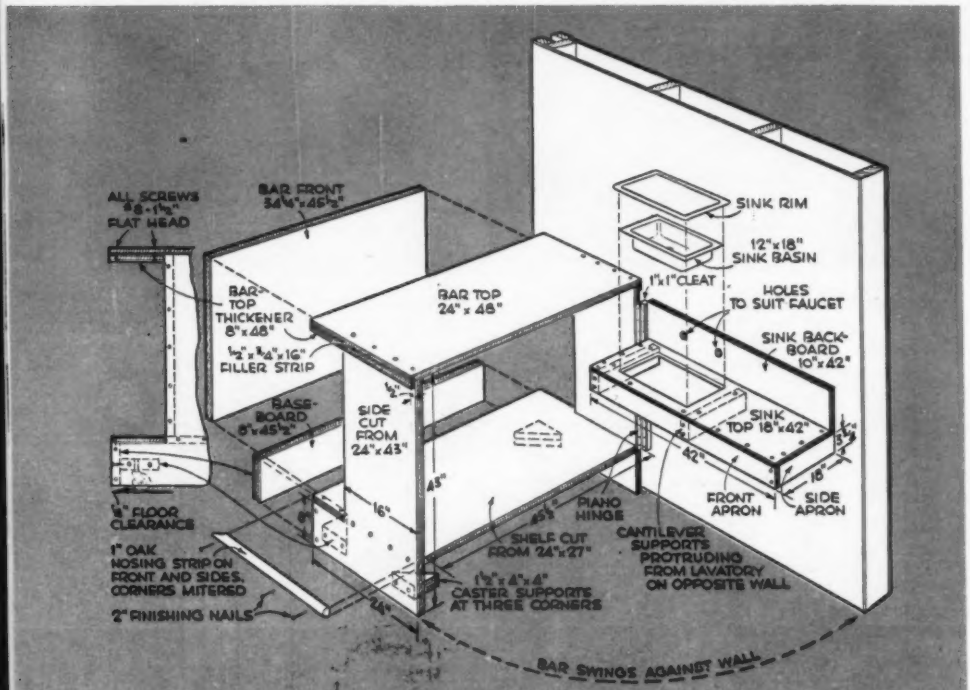
two units take no more game-room space than one.

In appearance, the installation can be the showpiece of your home. The walls, bar, lavatory and sink counters are all covered with plastic-surfaced hardboard. Sheets of this easy-to-handle and durable material come in a wide enough range of colors, designs and patterns to suit any taste.

Check codes first. Before you start this project, call on your plumber to recommend a hookup that will comply with local regulations. If you're dealing with a concrete floor, ask him about the feasibility of framing an elevated platform for the toilet. This eliminates the expensive chore of jack-hammering a trough for its waste and vent pipes. Instead, they rest on the top of the slab, with the water closet raised high enough to accommodate the lead bend to the wall.

Framing the plumbing wall. In the installation shown, two-by-six studs spaced on 2′ centers call for only two breakthroughs for the horizontal pipes. A pair of two-by-fours spiked across two of the studs offer cantilevered supports



LIST OF MATERIALS

¾" fir plywood (two 4′x8′ panels)

for bar:
- 1 pc 24"x48" top
- 1 pc 8"x48" thickener
- 2 pcs 24"x43" sides
- 1 pc 34¼"x45½" front
- 1 pc 8"x45½" baseboard
- 1 pc 24"x47" shelf

for sink:
- 1 pc 18"x42" top
- 1 pc 10"x42" backboard
- 1 pc 3¾"x42" front
- 2 pcs 3¾" x 17¼" side
- 2 pcs ½"x16" filler strips
- 6 pcs 4"x4" caster triangle supports

"Hard-glass" plastic-surfaced hardboard (one 4′x8′ panel)

for bar:
- 1 pc 24"x48" top
- 1 pc 1⅝"x48" front edge
- 2 pcs 1⅝"x24½" side edges
- 1 pc 8¾"x47¼" baseboard
- 1 pc 8½"x47¼" footrest

for sink:
- 1 pc 10½"x42¼" backboard
- 1 pc ¾"x42¼" top edge
- 2 pcs ¾"x10" side edges
- 1 pc 17⅜"x42¼" top
- 1 pc 4½"x42¼" front
- 2 pcs 4½"x18" side

Plastic-surfaced hardboard (one 4′x8′ panel)

- 1 pc 34¼"x47¼" bar front
- 1 pc 24"x43" bar sides

Miscellaneous

- 1 7′ length 1" nosing
- 1 ¾"x30" piano hinge
- 1 1"x1"x30" pine cleat
- 100 1½" #8 flat head screws
- 1 qt. waterproof mastic

CONTINUED

SHOPMATE®

ALL-NEW

Radial Arm Saw

WITH PATTERNMAKER PRECISION AND "DUAL PORTABILITY"

FIRST RADIAL SAW WITH DUAL PORTABILITY EVER OFFERED AT ANYWHERE NEAR THIS LOW PRICE!

USE AS A PORTABLE SAW . . . 7" saw detaches in 8 seconds.

OR A RADIAL SAW . . . makes every cut!

So many more features for so much less . . . *all* the accuracy and *twice* the versatility in a rugged, big capacity precision instrument that produces an endless variety of professional quality work!

Powerful 1 hp automatic safety clutch saw makes all cuts easily: cross cuts, dados, rips, mitres, bevels, cove cuts, etc. Other features include: widely spaced fully protected ball bearing carriage, heavy-duty ⅝" Acme elevating screw inside extra sturdy ground nickle-plated column, automatic self positioning precision adjustments, automatic quick changing lever adjustments, anti-kickback in front of blade, fingertip power control, 8-second blade coast-down, full 180° swing, and many other outstanding features.

NEW! Special plastic impregnated table guaranteed not to warp!

POWIS Shopmate TOOLS — JOB TESTED

SAVE OVER $100

$149.75

SUGGESTED RETAIL

At hardware and building supply dealers or write
PORTABLE ELECTRIC TOOLS, INC.
320 WEST 83rd STREET, CHICAGO 20, ILLINOIS

MAIL THIS COUPON FOR INFORMATION ON THE SHOPMATE RADIAL SAW! PS-99

Name _____

Address _____

City _____ State _____

All panels at top—ventilation below head level.

All panels at bottom—draft is off your feet.

Panels all at center—creates "thermo-air" circulation.

CREATE A CONVERTIBLE ROOM Out of Your Summer Porch... *Enjoy Porch Pleasure Winter, Fall, Spring and Summer with Unique, Versatile DeVAC GLASSWALLS!*

Remodel your summer porch, or build from the ground up, with DeVAC GlassWalls, and your porch becomes an attractive "extra room" for pleasure-full year-'round living. Only DeVAC GlassWalls have three aluminum sliding panels for directional control of ventilation (see diagram) . . . panels that lock securely in a variety of positions with DeVAC's exclusive, easy-to-use Pin-Lock device.

DeVAC GlassWalls are floor-to-ceiling "package" sections with fabricated wood frames around the three aluminum and glass sliding panels. Installation is easy and fast, and requires only the normal carpenter's tools. Each glass panel is easy to remove from inside the room for cleaning. Extruded from high-grade, heavy-duty anodized aluminum, they won't rust, fade or corrode. And each unit includes strong, full-length Fiberglas screens on the outside.

MAIL COUPON TODAY

Architectural details are in Sweet's Catalog.

DeVAC, INC. P.S.-59
5900 WAYZATA BLVD., MPLS., MINN.

Please send complete installation and price information.

NAME _____

ADDRESS _____

CITY _____ STATE _____

READY FOR ACTION, the bar has plenty of under-counter space for live and dead soldiers.

PARTY'S OVER, and if you treasure your soda-pop supply, a lock will foil small raiders.

for the sink on one side, and twin wash-basins on the other.

If your rumpus room is in the basement, or has a slab floor, anchor the framing to it this way: Position the sill, and hammer spikes through it every two feet or so, pounding them hard enough to mark the concrete below. Then remove the sill and make a hole at each position with a carbide-tipped bit or star drill. Drive a wooden plug into each hole, put the sill back in place, and spike into the plugs. Follow the same technique to pin down the sill for the other wall of the bath enclosure, and to attach studs to masonry walls.

Once the wall is framed, it's time to have your plumber install the hot and cold water-supply lines and the waste and vent pipes.

Furring the frame. As already pointed out, spacing the plumbing-wall studs wide apart makes sense as far as the pipe installation goes. But the frame must also offer a firm support for the plastic-covered hardboard used to face both sides of the wall.

To back the material properly, use horizontal furring strips, spaced no more than a foot apart, center to center. Vary the spacing on the conservative side, where necessary, to provide support behind the horizontal edges of all panels. Also apply vertical furring strips to the two studs framing the sides of the cabinet on the powder-room side.

Don't use nails to fasten the hardboard to the strips. Apart from looking uncraftsmanlike, they'll chip the hard plastic surface. Instead, attach the panels with contact cement or special mastic.

On the adjoining enclosure wall you can cement the panels directly to the frame if you space the studs on 1′ centers. For studs spaced farther apart, use furring strips. While you're at it, why not custombuild a door to match the wall? If you wish, you can insert perforated sections for ventilation, as they, too, are available with plastic surfacing.

These basin and sink tops save money. The cantilever supports projecting from the plumbing wall give you a good start in the handsome but inexpensive twin basin and sink counters. Both are built around these basic framing members and, in the case of the former, another two-by-four spiked to the end-wall studs.

Their sides and tops are sections of exterior plywood, butt-jointed together with screws and overlaid with plastic-surfaced hardboard. Be sure to specify the "high-gloss" variety intended for use in baths and even showers. Bond it to the plywood with contact cement, or with one of the waterproof mastics put out by Marsh Wall Products and other manufacturers.

When you order the sink and basins, get the kind that comes with mating aluminum or stainless-steel rims. Those shown in the photos are American-Stan-

CONTINUED

Enclose unsightly storage space easily!

MACKLANBURG DUNCAN CO.

Aluma-Slide
SLIDING DOOR TRACK

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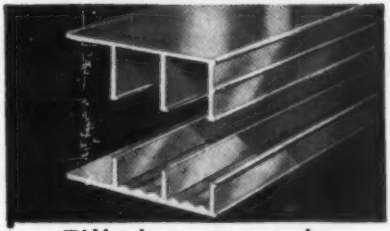

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A DIVISION OF **GENERAL DYNAMICS**
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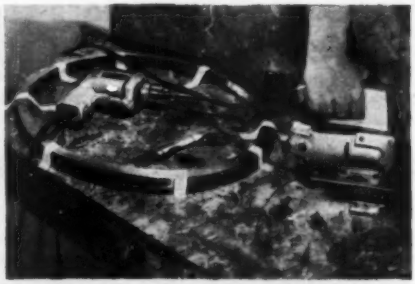
dard's model P7028 sink and two model F 470 lavatories. Cut the openings in the counter tops to fit the rims, *not* the basins. Finish off the units by applying backboards bored for faucet connections.

Finishing off the medicine cabinets. Use one-by-sixes for the tops and a single piece of one-by-nine, notched for the studs, to form the bottoms. Face the furring at the back of each cabinet with hardboard before toenailing shelves to the studs. Apply trim strips to the sides and top of the opening, and install double-groove tracks for sliding mirrors.

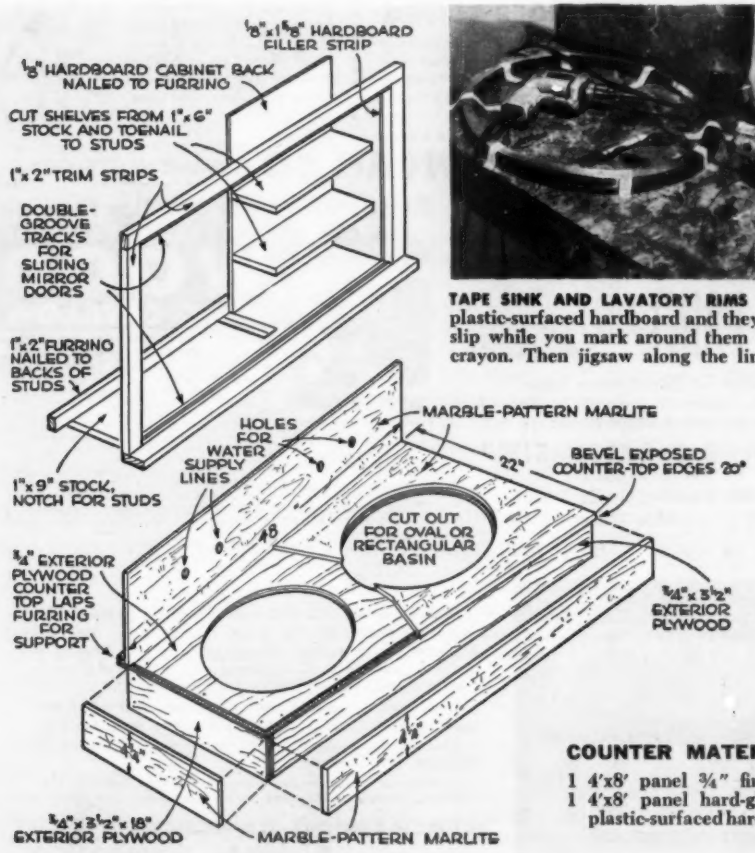
Pivoting bar is the big space saver. A piano hinge and three tea-wagon casters let the bar glide smoothly between open and closed positions. When in use, one side butts against the plumbing wall, conveniently at right angles to the sink. Swing it around and it boxes in that fixture, with clearance below for the contents of its storage shelf.

Again, it's a plywood-and-hardboard fabricated job, with a "high-gloss" surface on top. Or use V-grooved hardboard with a plastic finish to cover the bar front and ends. The footrest—a projection of the storage shelf—is edged with oak nosing to stand the scuffing a popular furniture piece like this is bound to get.

THE MARSH WALL PRODUCTS COMPANY has made separate working plans available for this basement-improvement project. If you like the convenience of working with such plans, address a postcard asking for the bar-bath plans to Marsh Wall Products, Inc., Dept. PR-1, Dover, Ohio.

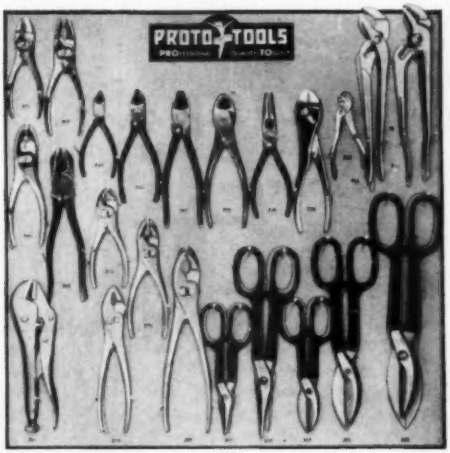


TAPE SINK AND LAVATORY RIMS to the plastic-surfaced hardboard and they won't slip while you mark around them with a crayon. Then jigsaw along the lines.



COUNTER MATERIALS

1 4'x8' panel 3/4" fir ply
1 4'x8' panel hard-gloss, plastic-surfaced hardboard



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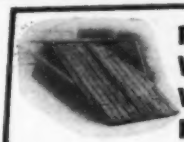

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Stepladders are invaluable at church bazaars or club functions. Paired as in Fig. 2, they become racks for slide-in display shelves. If movies are planned, the paint tray of a ladder will hold a projector (Fig. 3), lifting it high above the audience.

A stepladder also can serve as a base for a footbridge (Fig. 4), an easel for a large painting, or a set of shelves for plants.

The last drawing shows an old ladder retired to the outdoors for use as a garden trellis.

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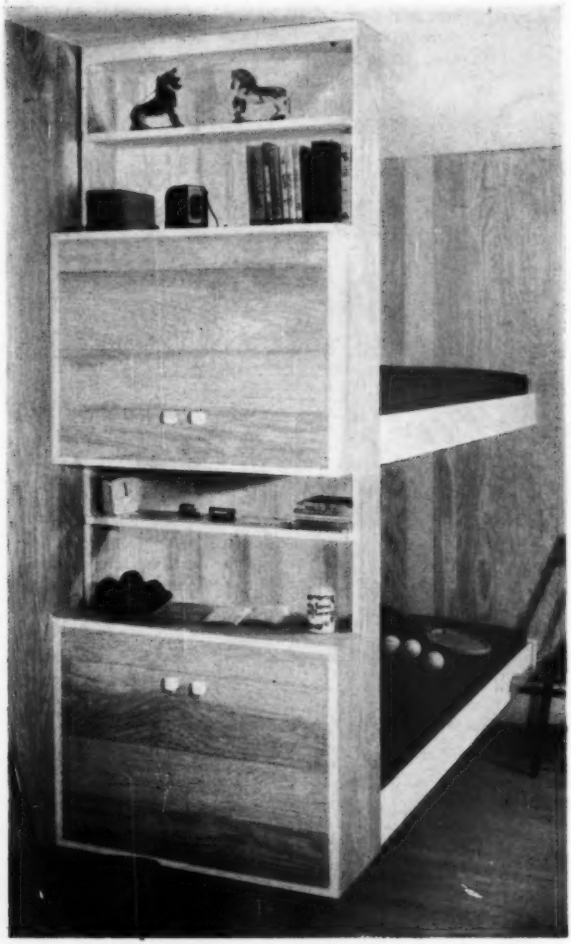
PS Home Improvement Plan 7

You can make good use of prefinished plywood in building this handsome

Bunk Bed That Hangs from the Ceiling



YOUR eyes don't deceive you—there is no base beneath this space-age bunk bed. It "floats" above the floor.

Hanging solidly from the framework of the house, the bunks are made of prefinished plywood matching the walls. This match makes them the ultimate in built-ins accompanying an attic-finishing or room-paneling project.

Such projects have been made easier—and tidier—by prefinished plywood panels. Once nailed in place, they're complete. And the decoratively perfect finishes are available in a variety of woods. "Gray Mist Ash" by Georgia-Pacific was used in the original room and bunk-bed project.

In spite of their lush professional appearance, the bunks are easy to build. Straight cuts and butt joints can be used throughout, making construction with hand tools simple.

The first construction step is to contact-bond a sheet of 1/4" prefinished wall paneling to a sheet of 1/2" plywood. This makes a workable panel 3/4" thick. You need a couple of quarts

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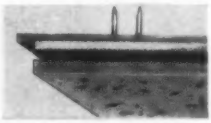
Here's the big difference you usually can't see!

Ordinary Staple

Often fractures the unseen back of the tile flange.



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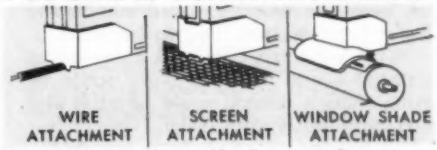

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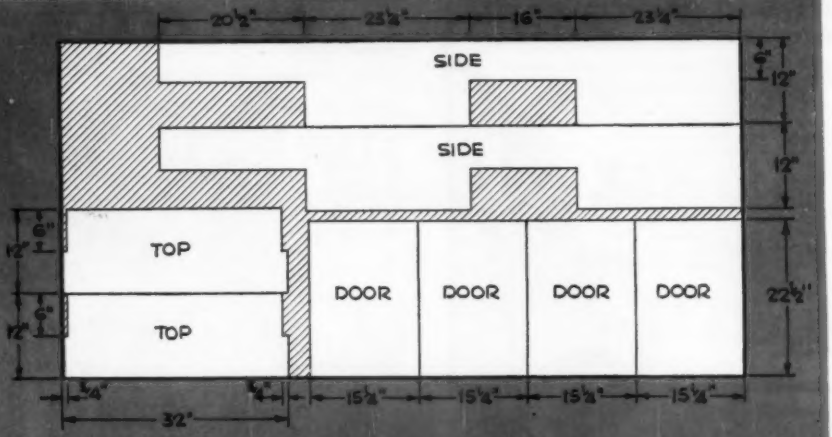

FOLLOW THIS CUTTING PLAN—leaving space for saw cuts—to get all important prefinished pieces from a four-by-eight panel. Reverse plan for bunks to fit a corner at right angles to the one shown. Doors are oversize, trimmed when hinged in place.

LIST OF MATERIALS

1 4' x 8' panel ¼" prefinished ply.
1 4' x 8' panel ½" fir ply.
2 4' x 8' panels ¾" fir plywood for:
2 cab. bots. 11¼"x30½"
2 cab. backs 23¼"x30½"
2 cab. shelves 10¼"x30½"
2 shelves 7¼"x30½"
4 bed rails 5" x 75"
4 end rails 5" x 30"
4 side cleats 2" x 73½"
4 end cleats 2" x 28½"
2 4' x 8' panels ¼" fir plywood for:
2 bunk bots. 29¾"x73¼"
1 pc. 2"x8" pine, 30½" (trim to 6" width)
2 ⅝" dia., 6" dowels
Miscellaneous: 60 1¼" #8 flathead wood screws, 10 2" #10 flathead wood screws, 6 ¼" x 3" carriage bolts, contact cement, glue, finishing nails, door pulls, hinges, catches.

Note: Lumber may be used for cleats, rails, and shelves. Bed rail and cleat dimensions should be checked against mattress size. Dimensions given are for 30" x 73½" mattress.

of contact adhesive for this job, but they're cheaper than the finishing materials you'd need to match raw wood to the paneling.

Careful cutting—see pattern—will put face veneer on all important surfaces. Where screws go through the finish, counterbore and fill the holes with plugs cut from scrap. This is an easy operation with the matched counterbore and plug-cutter sets now on the market.

(With accurate cuts and close-fitting joints, glue and finishing nails would be strong enough. Heads could be sunk and filled with putty-stick filler.)

The headboard's top cross member—the piece which fits against the ceiling—is made of 2" stock pine. To reinforce the outer end of this piece, two ⅝" dowels are glued in holes drilled through its width. The dowels give firm anchorage for screws and beef up the end grain.

This screwed-and-glued but joint can be replaced by an even stronger tenon and dado joint if power tools are available. Dimensions for such a joint are included in the drawings.

The suspended corner of the bed can be secured to the ceiling most solidly by ½" machine bolts into a two-by-six saddle crossing the tops of several joists. This bolt-and-saddle system will hold the bunks regardless of their use as landing fields or trampolines by husky youngsters.

Where a finished floor or cramped attic prevent access to the top of the joists, you can use one of the alternate fastenings. One of these amounts to simply lag-screwing the top member to the ceiling joists, or to a joist-high bridge spiked between two ceiling joists.

The original flying bunk bed was secured by ⅜" lag screws to a single joist, and shows no eagerness to descend.

Wherever lag screws are used, they should be centered in the joists as ac-

CONTINUED

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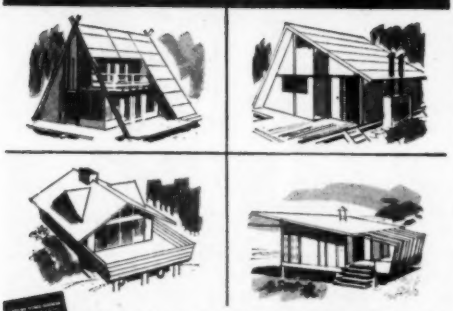

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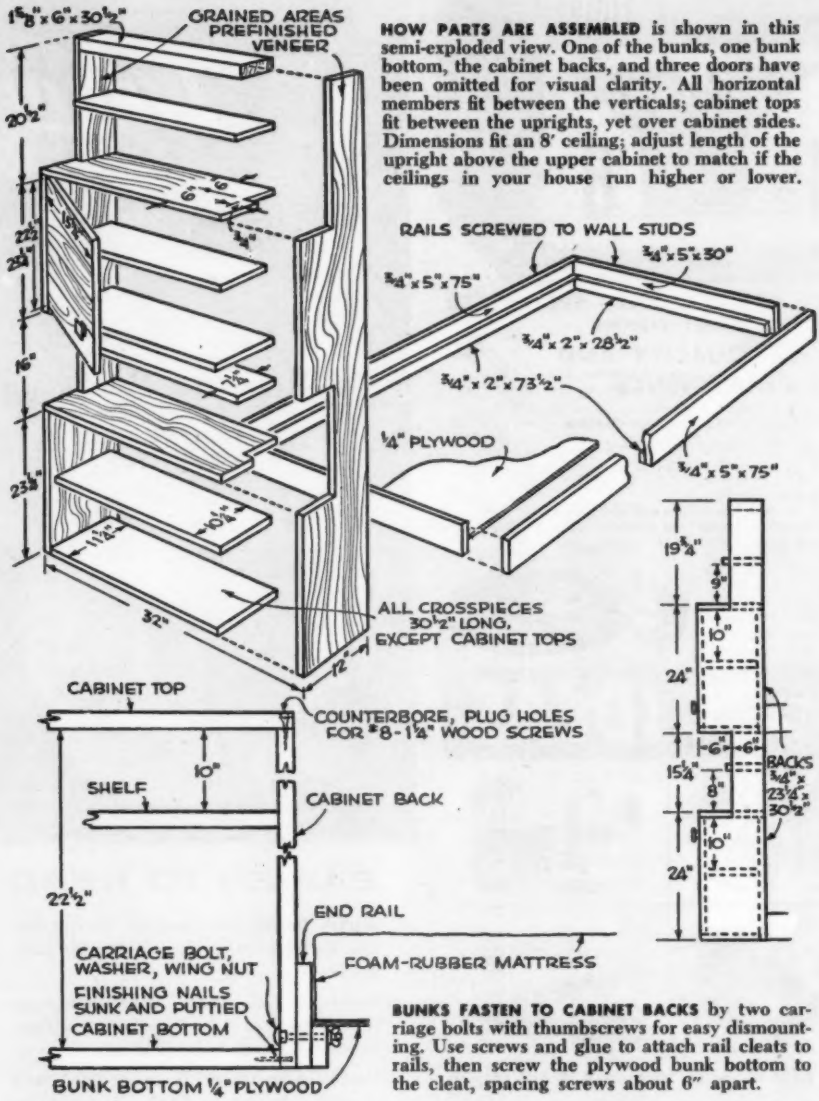

HOW PARTS ARE ASSEMBLED is shown in this semi-exploded view. One of the bunks, one bunk bottom, the cabinet backs, and three doors have been omitted for visual clarity. All horizontal members fit between the verticals; cabinet tops fit between the uprights, yet over cabinet sides. Dimensions fit an 8′ ceiling; adjust length of the upright above the upper cabinet to match if the ceilings in your house run higher or lower.

BUNKS FASTEN TO CABINET BACKS by two carriage bolts with thumbscrews for easy dismounting. Use screws and glue to attach rail cleats to rails, then screw the plywood bunk bottom to the cleat, spacing screws about 6″ apart.

curately as possible. Finding the joist centers may demand drilling exploratory pilot holes; locate the holes so they'll be covered by the bed. If you must use the surface cleat to cross inaccessible joists, paint it to match the ceiling—it'll practically disappear.

Half the bunks' weight is carried by the walls; side and end rails are screwed to wall studs. If you're using horizontal furring strips in applying wall paneling, make sure the bed rails don't fall between strips.

You can insure solid support either by

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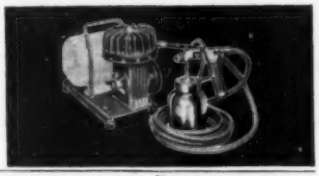

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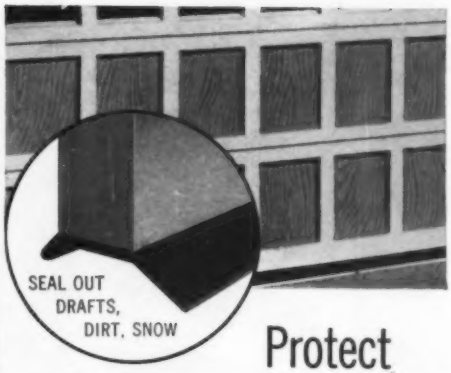

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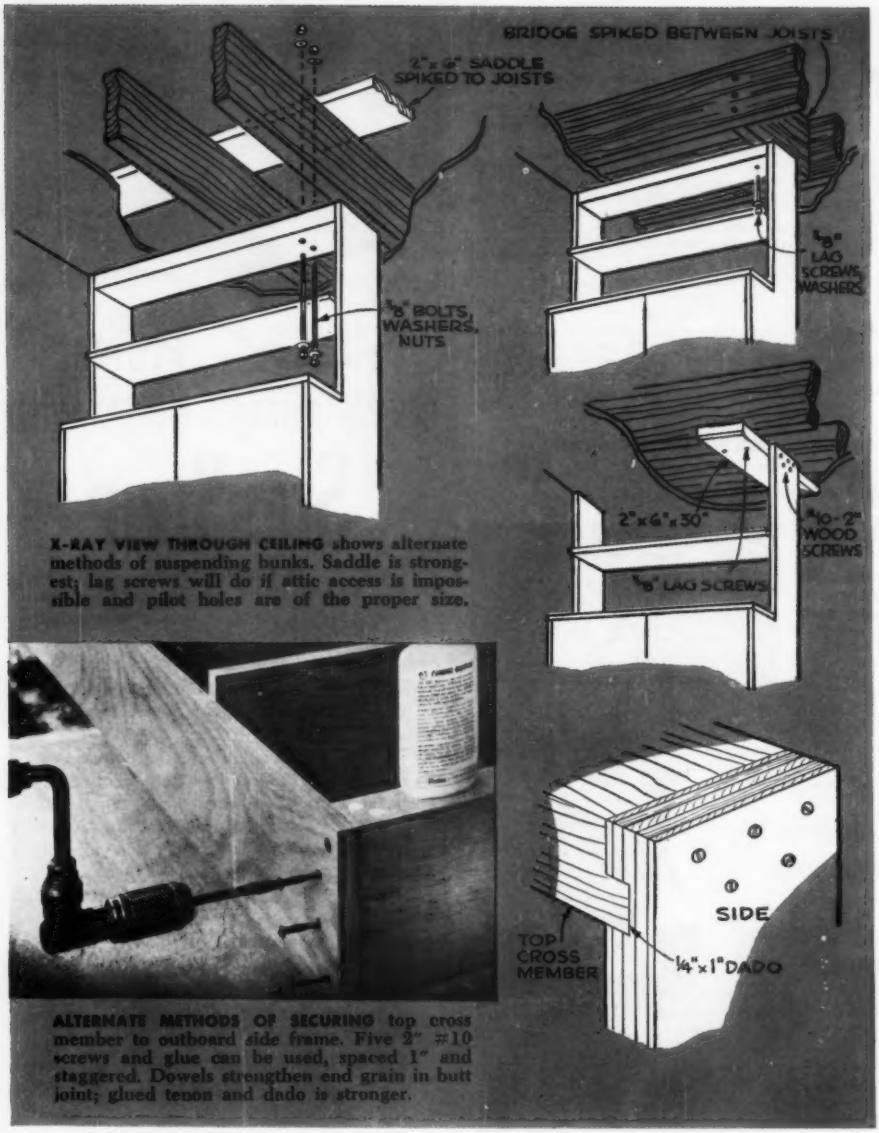

X-RAY VIEW THROUGH CEILING shows alternate methods of suspending bunks. Saddle is strongest; lag screws will do if attic access is impossible and pilot holes are of the proper size.

ALTERNATE METHODS OF SECURING top cross member to outboard side frame. Five 2" #10 screws and glue can be used, spaced 1" and staggered. Dowels strengthen end grain in butt joint; glued tenon and dado is stronger.

relocating the strips or nailing filler blocks to the studs between the strips.

What finishing the bunks need can be done before or after they're in place. Rub water-mix putty into the plywood edges, and then sand to hide sandwich effect. The open shelves' protruding corners may be rounded, if desired, before painting.

THE GEORGIA-PACIFIC CORP., Equitable Building, Portland, Ore., has made separate working plans available for this suspended bunk bed. If you like the convenience of working from such plans, write to Georgia-Pacific, as above, asking for the bunk-bed plans described in Popular Science Monthly.

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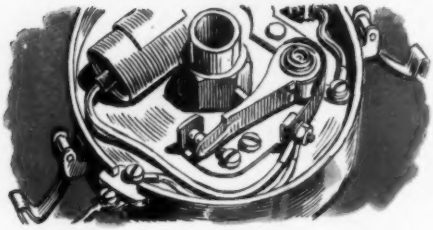
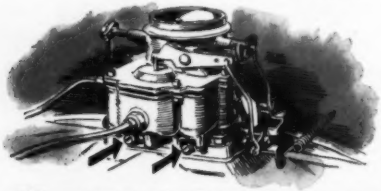
Answers to Troubleshooting Quiz on Page 154



1 This is a trouble that can be caused by wear in the ordinary operation of the car. The rubbing block on the breaker arm is worn so the points are not opening enough. The gimmick used was to adjust point gap to .001 inch.

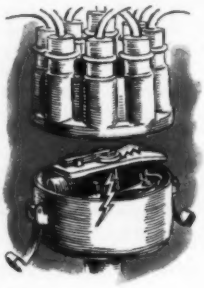
2 A defective ground cable or connection would cause this. A concealed insulating sleeve under the battery clamp was installed for the contest.

3 Either a grounded breaker-point arm or a shorted condenser could be the trouble. Sparking to the distributor terminal with the points open is the revealing clue. For the contest a steel washer was placed under the breaker-point arm so that the arm was grounded.

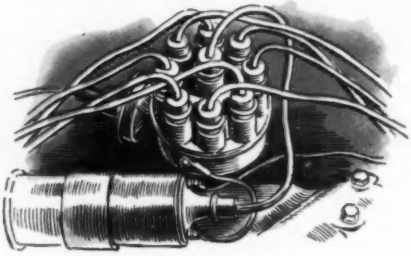


4 Idle passages in the carburetor were clogged, starving the engine unless throttle was open. The idle mixture-adjustment screws were screwed in tight to simulate this condition for the contest.

5 Distributor rotor is grounded. Since there was good spark up through the high-tension wire and it is unlikely that all eight spark-plug wires would be defective, the trouble was localized to the rotor and distributor cap.

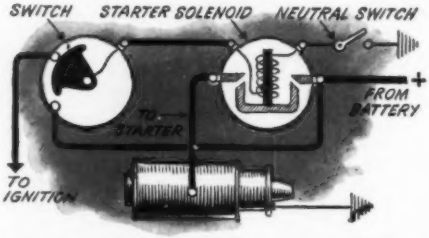


6 Gas feed line from the tank was clogged. There was enough fuel in the carburetor bowl to run the engine briefly. Applying pressure to the tank should cause enough fuel to flow to wet the paper if the line were open.



7 Two of the spark-plug wires were interchanged at the distributor cap. This is a well-known practical joke. Since the timing light is connected to number one cylinder and it had not been switched, correct timing was indicated.

8 Engine is completely out of time. This is likely to happen only if you had taken the distributor out of the engine to work on it and failed to replace it correctly. Other possibilities are a stripped gear or timing chain. For the contest, the distributor shaft was given a half turn from its correct position.



9 The primary wires at the starter solenoid have been switched so that juice reaches the ignition system only when the ignition switch is in the "start" position. As soon as the switch is returned to "run," ignition is shut off.

10 Coil resistor is burned out.

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Short Cuts and Tips
FROM PS READERS

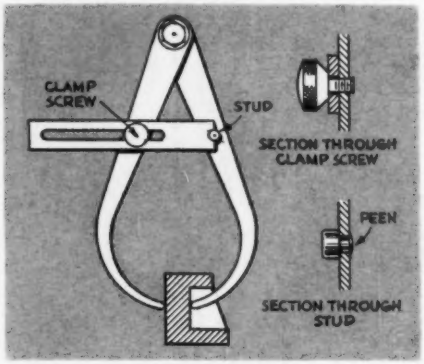
How to Refuel a Power Mower

DON'T refill your power mower on the lawn or on a driveway having a tarred surface. Spilled gasoline kills grass and also dissolves some blacktop mixes.

It's best to refuel over dirt or concrete. A piece of kitchen foil makes a throw-away drip pan.—*R. M. Woodbury, Natick, Mass.*

▶▶▶THOSE synthetic sponges you can buy in dime stores make good pin cushions. They require no preparation; just jab in pins.—*R. Willey, Penacook, N. H.*

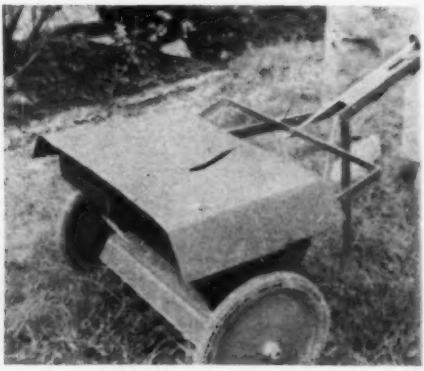
▶▶▶A FLEXIBLE plastic bottle makes a good graphite dispenser. But be sure to clean it thoroughly before putting in the powder.—*L. F. Black, Cedar Rapids, Iowa.*



Making Transfer Calipers

YOU can convert standard calipers to transfer calipers by fitting them with a stud on one leg and a sliding-clamp gauge on the other. Drill and tap one leg for the clamp screw and slot one end of the spacer bar to slide on it. Drill the bar's other end to fit over the stud and saw it off through the center of this hole.

When taking a measurement on work that won't allow for removal of the calipers without opening them, press the spacer against the stud and tighten the clamp. The calipers can be quickly reset after removal.—*F. Murray, Chicago.*



Cover for Lawn Spreader

YOU can use your seed and fertilizer spreader on windy or rainy days if you cover its top opening with an asphalt shingle. Fold the ends of the shingle to fit tightly over the top. It will keep the contents from blowing or getting wet.—*R. M. Watson, Athol, Mass.*

▶▶▶MOST automobile jack handles double as a lug wrench and a pry for removing hubcaps. If you want to avoid nicking the wheel finish when prying off a hubcap,wrap the fulcrum with rubber or plastic tape.—*Leland Valaske, Green Bay, Wis.*

PONTIAC IS THE ONLY CAR WITH WIDE-TRACK WHEELS

Wide-Track Wheel design brings car and road into a new relationship. The wheels of a Pontiac are farther apart, widening the stance but not the car. There's a feeling of complete control, road-holding response. You're steadier, more secure, balanced. It's the automotive advancement of the year and one of the big reasons Pontiac is now first in sales in its price class. Hasn't the day come for you to drive this sleek beauty? The keys are waiting at your nearest dealer.

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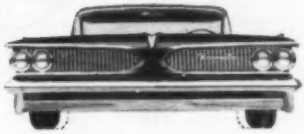

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Pontiac wheels are five inches farther apart. This widens the stance, not the car. Lower center of gravity makes the car grip the road. Lean and sway disappear. You get safer cornering, easier handling, a steadier, balanced, smoother ride.

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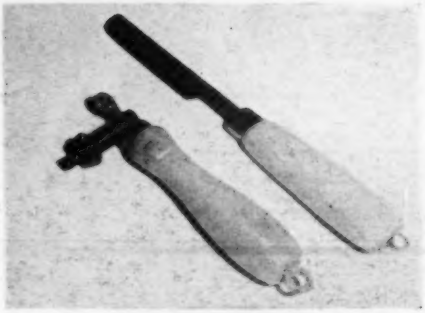
Short Cuts and Tips
FROM PS READERS

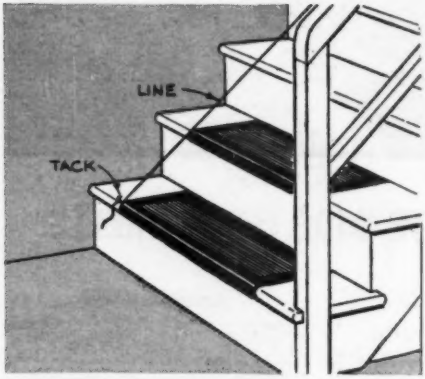


Uses for File Handles

FILE handles come in handy for mounting tools other than files. I recently put one on my drill-chuck key and another on the old straight-edge razor I use for fine cutting. With eyelet screws in the ends, they hang conveniently over my workbench.—*R. H. Herhold, Sheboygan, Wis.*

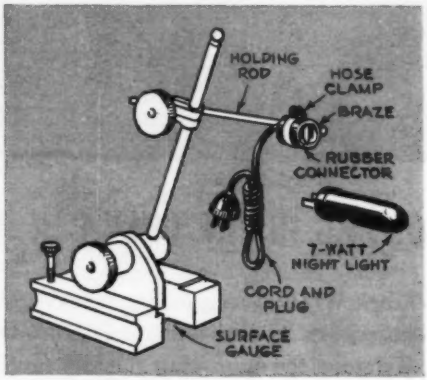
Throw-Away Paint Funnels

IF YOU keep a supply of cone-shaped paper cups in your workshop or garage, you will always have at hand a good funnel for pouring paint, turps, oil, varnish and the like. Snip off the end with scissors. Discard the cups after use.—*Mrs. Edwin Johnson, Iron River, Mich.*



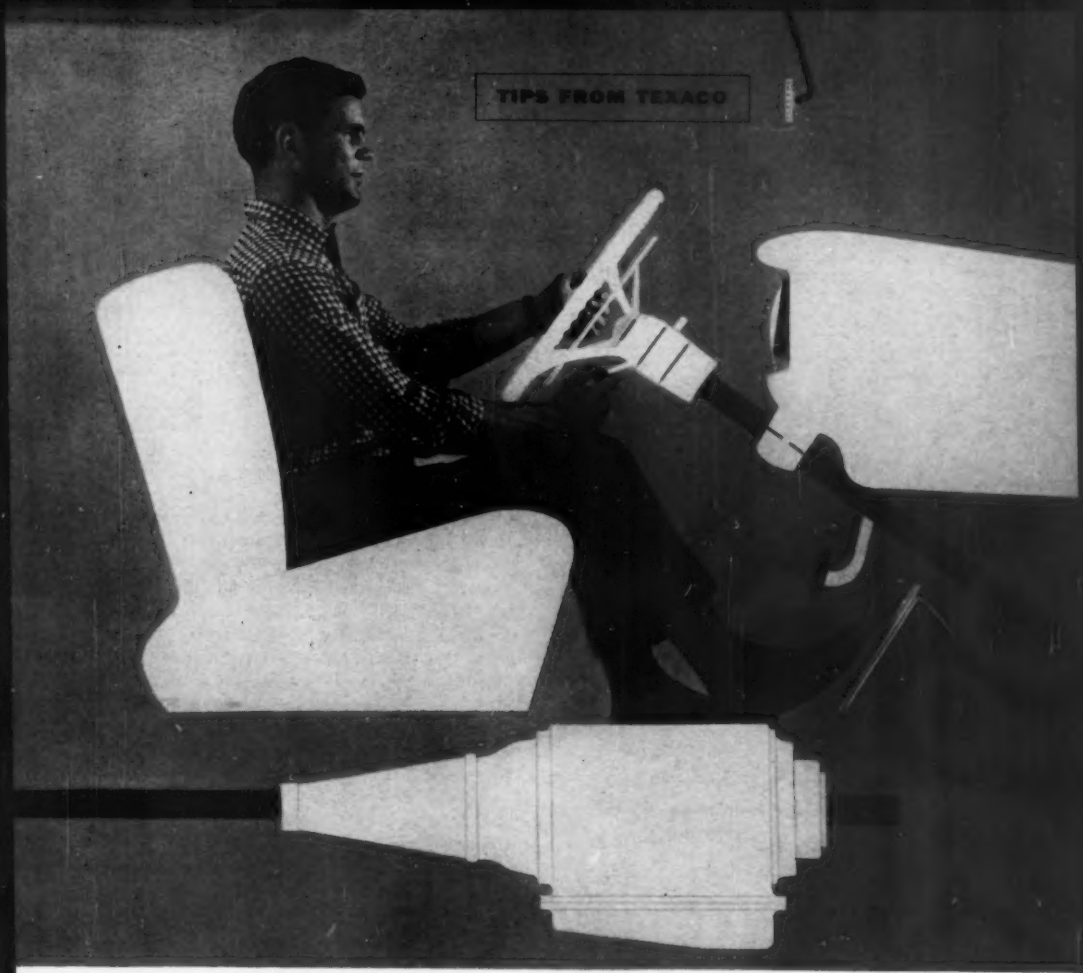
Aligning Stair Treads

WHEN I install stair treads, I make sure of perfect alignment by using a line guide. Procedure is simple: Place one tread in position, measure the distance from the wall, and mark it off on three steps—at the top of the stairway, in the middle and at the bottom. Run a line touching these points, anchor with tacks, and lay the treads to conform.—*Daniel Bousha, Jackson, Mich.*



Portable Shop Lamp

AN OLD standby with pro machinists is this method of rigging up a convenient shop lamp from a surface gauge. Braze a hose clamp to a rod of the diameter of the scriber; it holds the socket end of the lamp cord. Then insert a seven-watt night light of the kind sold at supermarkets and hardware counters. The lamp will put light in hard-to-see spots.—*R. B. Courtney, Whittier, Cal.*



How to care for your automatic transmission

1 Apply your parking brake or keep your foot firmly on foot brake before starting engine or shifting automatic transmission from neutral into any driving range.

2 When a red light stops you on an upgrade, apply either parking or foot brake, then shift transmission into neutral. For a wait of only a minute or two it's permissible to push the gas pedal down just enough to make the engine "hold" the car on the grade.

3 When driving downhill, never shift into neutral and allow your car to coast. This is illegal, and also dangerous.

4 Make sure you are completely stopped before shifting from "drive" to "reverse."

5 When you leave your car, make sure ignition is turned *off* and key removed, the parking brake set tight, and gear selector set at "park" or "neutral."

6 Never have car pushed or towed without first making sure the procedure being used is correct for *your* make of car.

7 Be sure you're using the finest automatic transmission fluid money can buy . . . and that fluid is up to proper level. No problem when you're a Texaco motorist. For Texaco Dealers service your car with Texaco Texamatic Transmission Fluid and they are trained to check fluid level regularly.

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Cars That Never Need a Grease Job
[*Continued from page 83*]

one of the slipperiest substances known; it has a lower coefficient of friction than graphite. Rubbing Teflon against Teflon is like rubbing ice against ice.

But the ordinary way of making plastic bearings—by casting or extruding the resin to shape, the way you'd make toothbrush handles—didn't work too well with Teflon. The bearings were okay for light duty, but heavy loads squeezed them out of shape.

The researchers found a way around this. They made the Teflon into fiber, like rayon (the process is similar to the drawing of steel wire) and then wove the fiber into fabric. You could tailor a suit out of it if you wanted to (it would look funny but never wear out). The Teflon fabric has 25 times greater tensile strength and resists deformation under load 30 times better than Teflon resin.

This fantastically strong and slippery fabric serves as a lining to separate moving metal parts. The fabric is bonded in the socket of the bearing, and the metal ball slides in the fabric cup. No other lubricant is needed, and it should last longer than the car.

50,000 greaseless miles. Impressive results came from tests on six 1958 taxicabs in Baltimore. Teflon bearings replaced the four ball-joint suspension bearings and seven steering bearings on each car. After 50,000 miles with the greaseless bearings, the test cabs were still perking along happily. An identical group of 10 cabs running the same mileage with conventional bearings needed 36 grease jobs.

Drivers of the no-lube cabs commented repeatedly, and happily, on the improved ride and handling performance. Several said they were less tired at day's end.

Dupont backed this up with controlled, instrumented tests on a '59 Chevrolet. First the Chevy was run with lubricated standard steel bearings. Then these were replaced by fabric bearings and the tests were repeated. Wheel fight was reduced and steering was smoother. Many annoying chassis squeaks disappeared.

It's all part of the engineers' dream: a car that needs no service ever. They would like to fix things so that all you have to worry about is keeping the gas tank filled.—*Ken Fermoyle.*

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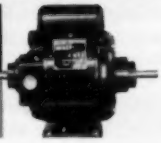

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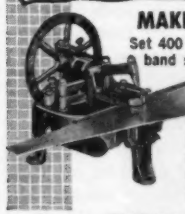

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[*Continued from page 75*]

"and that speed would be much greater if all three lanes were used"

He pointed at a car that was pulling away slowly from the toll gate. "Slow acceleration is another cause," he said, making the same point Wells had.

He slipped the Ford into low gear and we buzzed away from the toll gate, headed toward the Harriman interchange. There, vacationers from the Catskills and Adirondacks were pouring onto the Thruway from Route 17.

It was 5:05 p.m. when Barber called the interchange for the latest count.

A flat voice rasped, "Just over 4,000, Seven Zero One."

Traveling in packs. On the long upgrade from Suffern, he pointed over to the heavily traveled southbound lanes. The cars were cruising in little groups with long gaps between the groups.

"We took motion pictures at several places," he said, "and we found that traffic moves like an accordion. It squeezes up, then spreads out; it slows down, then speeds up. If drivers closed up the gaps and held a constant speed and distance, there'd be far fewer bottlenecks."

We bore north, looking for openings in the middle and center lane and cutting quickly into them to pass. At Harriman, we pulled to the side and watched the cars feel their way cautiously out of Route 17 and into the southbound stream.

Traffic had begun to back up on both 17 and the Thruway. Lt. Barber said, "There's another cause for your snarls. Weekend drivers just aren't used to highway speeds. They drive in the city at 20 all week and they're afraid to take advantage of the Thruway's 60-mile-an-hour speed limit."

He eased the Ford around the cloverleaf, dipped smoothly into the southbound lane, and started working his way back toward the Palisades bridge. Though well within the speed limit, we passed one car after another. I could see that to take advantage of the Thruway, you have to work hard when traffic is heavy. But it pays off—until you get trapped.

A mile ahead I saw the frantic blinking of a trooper's warning beacon. Barber stretched to look.

"There's a good example of what causes bottlenecks," he said. "That disabled car is well off the highway. It's not in our way, but we're trapped. Every driver slows down to see what the trouble is. Each driver slows down the one behind him a little more, and traffic slows almost to a stop. And they'll all take their own sweet time accelerating once they get by."

Keeping moving. "It's a good rule, then, to keep moving," I said, "especially coming out of toll gates, climbing hills, entering traffic, or passing disabled cars."

"Right," said Barber. "Maintain speed consistent with safety and you've got it made."

Wells' voice cut in. "I'm on the bridge at the Palisades Interstate Parkway intersection," he said.

"We're on our way," said Barber. He put down his mike. "That's where we get our biggest jam," he said. He looked at his watch. It was 6:15 p.m. "By now," he said, "they should be backed up two miles there."

They were.

It took us 20 minutes to fight our way to Wells from the milepost where we had ground to our first stop. By the time we reached him, six crews had strung traffic cones along the inside track of the northbound highway from Route 303 to Harriman. Wells had given the order to divert some of the overflow into this fourth "lane" on the far side of the mall.

"We can push a thousand cars an hour through that extra lane," said Wells. "It's a new experiment that is paying off."

He pointed down the long grade that dropped away from us southward to a steep rock cut, then started up again toward the Route 303 intersection.

"Right here," he said, "we have a combination of problems. Drivers feed in too slowly. Then they slow down at that rock cut. Finally, they pick up too slowly on the upgrade.

"Actually, the Thruway is just as wide, just as safe, and just as easy to drive here on this stretch as it is anywhere else. Yet look at the jam-up."

It was hard to swallow. For a long while I didn't believe it. I waited for a report to come in saying a four-car accident or something worse had blocked all four southbound lanes somewhere south of us. But the radio droned on casually.

Off to the north, the sky was darken-

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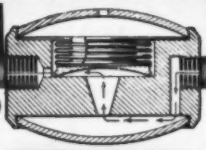

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ing. In two minutes the radio crackled, "Heavy rain south of Spring Valley." We watched the storm sweep toward us, then raced for the Olds.

At 8:00 p.m., the rain was still droning on the roof and it was getting dark. Wells looked troubled. "It'll hurt a little if it keeps raining after the sun goes down," he said. "Darkness alone doesn't slow us much, but when it rains at night, they drive pretty slowly—as they should."

With almost hypnotic fascination, we stared at the slowing cars beneath us. More than 5,600 an hour were being fed into the Thruway at Harriman now.

"It'll probably be stop-and-go until 10:30," said Wells. "Then they'll gradually speed up. By 1:30 in the morning they'll be humming through at 55."

"And those drivers are making their own trouble," I said. "Your films and still photographs—do they show the Thruway could handle this load? That is, if the drivers themselves kept pressing and used the right techniques?"

"Right. There's nothing we can do about it. If the drivers keep moving, there are no bottlenecks under normal conditions. It's the same on every modern turnpike and expressway in the country."

"Will the drivers ever learn?" I asked.

"Sure. They're learning to drive the expressways now. We took in 10.2 million more toll payments in 1957 than we did in 1956, yet our fatality rate dropped from 2.68 to 1.94 per 100 million miles."

Into the mainstream. At 10 p.m., I climbed into Lt. Barber's patrol car to pick up my station wagon two miles further south. Slowly, maddeningly, we inched into the mainstream, then past the "forbidding" rock cut, and up the gentle grade to the Route 303 intersection.

"It's hard to believe that drivers in a hurry will let these three little things cause a five-mile traffic jam," I said. "There must be something up ahead that we can't see."

"If there were," he said, "we'd have heard about it on the radio."

I thanked him for the lift, and then, after he had gone, I scrambled up the high bank in the rain and looked south to see for myself.

Lt. Barber was right. The road was clear.

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1859—Celebrating a Century of Oil Industry Progress—1959

Secrets of the War Against Time Bombs
[*Continued from page 81*]

trip the switches. One officer solved this by playing a steam hose on the fuse boss to discharge the condensers.

Taking dares came easy to men who lived on a razor edge of death. A cautious subaltern, finding a new fuse, went off to study the latest bulletins. Removing the fuse next day, he found the gaine missing, in its place a birthday greeting from two brother officers.

Among the most memorable of the early disposal experts was Lord Suffolk, a peer who turned up at many bomb sites during 1940 and early 1941. Arriving in state in his limousine, Lord Suffolk was invariably accompanied by his chauffeur, to assist with the tools, and by his secretary, to take dictation in case something new was encountered. Their narrow escapes earned this trio the name of The Holy Trinity.

Typical of Lord Suffolk was his method of stopping one delayed-action fuse. He fired a bullet into it. (The Germans countered by inverting the clock so that the bullet would hit the cap.) But in May, 1941, after many months of successful defusing, the Trinity's phenomenal luck ran out. A 250-kilo bomb killed the gallant three, and five others.

How did disposers identify the fuses they were up against? By the German markings. One new symbol might be the warning of a dangerous modification, as Captain F. Carlyle lived to discover. Finding a jammed fuse that seemed routine except for an extra "Y" on the mark, he bashed it out with hammer and chisel. But something new had been added—a dry-cell circuit with three mercury switches so arranged that a tilt in any direction would close one. All that saved Carlyle's life was a break in the wiring.

Discharging fluid, pumped into this fuse, fired the battery circuit. The ingenuity of Major J. P. Hudson licked this one. He froze the dry cells by pouring liquid oxygen around the fuse head. Chilled, they couldn't energize the circuit.

Equally clever was a dodge that stymied clockwork and mechanical booby traps. An air pump was used to create a partial vacuum in the fuse pocket; then fast-setting plastic was injected.

Do-it-yourselfers were sometimes a menace. Asked by an old lady to remove

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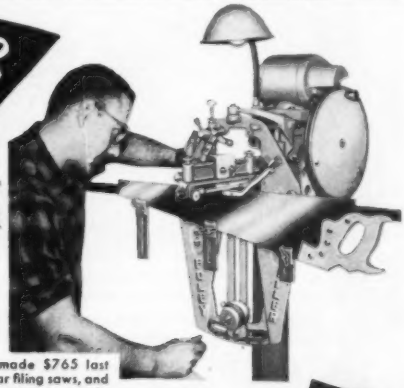

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Ask yourself these three questions: 1. Do I really want to get ahead *faster?* 2. How can I do it? 3. Am I willing to *use* my spare time? If you answer "Yes" to questions 1 and 3—then we have a positive answer for you on No. 2. Men make from $3 to $6 an hour sharpening hand, band and circular saws with Foley Saw Filers. No experience needed, to turn out sharp, smooth-cutting saws with this automatic machine. Start in spare time—no canvassing.

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"Last year's profit amounted to $3,000. Not so bad for a one-man outfit."—Charles C. Hough.

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back with repeat orders." —Len Crego.

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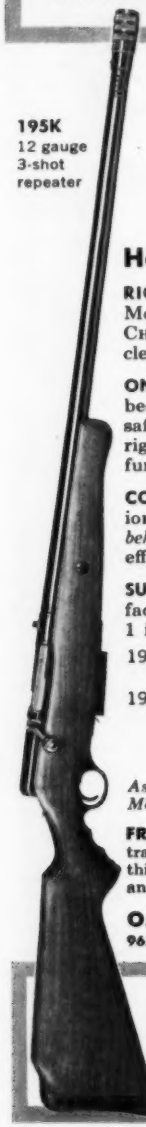

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Secrets of the War Against Time Bombs

"part of a fallen plane" from her back yard, disposers were shocked to find an eight-foot-long parachute mine at the foot of the scullery steps. They were more stunned to see that the householder had built wooden steps over this sensitive horror "to get to the coal and dust bin." With far less aplomb, the disposers tore the structure down, flinching each time a nail squeaked. When the mine was eased over, the clock started. It ran 12 of its 17 seconds before it was gagged.

Another independent soul, finding his house under guard because a bomb had crashed into it, argued his way in. The bomb was sticking out of the kitchen floor. Lifting the 112-pounder, he went out the back door and dumped it in a park. He was fined three pounds.

It's not yet over, this suspense story of men battling the ferocious ingenuity of men. Last April a live one-tonner was found under a building site in the heart of London. Just this July, workmen unearthed a 500-pounder with dual clockwork and a booby trap.

Working in a 14-foot hole, disposers steamed out all but three pounds of the main charge. When detonated, this small residue broke windows in a 150-foot radius—a grim sample of what had to be endured in the blitz.

QUADRUPLE PLANTER. Front wheels are 120 inches apart on the experimental axle of the tractor above, the rear wheels centered at 40 inches. International Harvester expects the setup to be useful for seeding four rows at once with a trailing wheel-track planter. Aim is to cut soil disturbance to a minimum.

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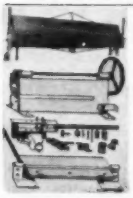

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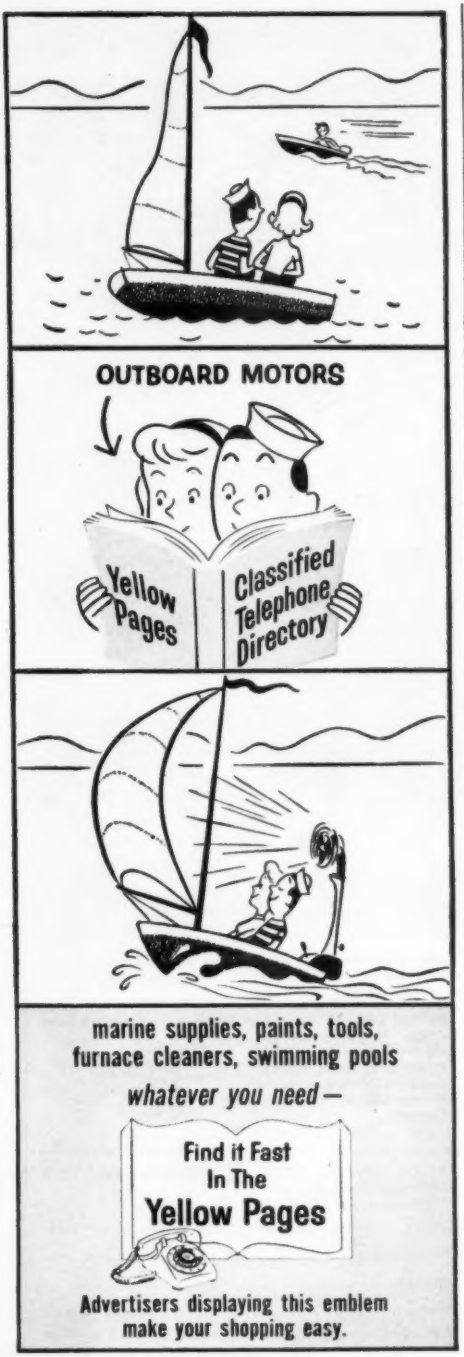

New Clutches for V-Belt Drives

[Continued from page 147]

sories and tools, take a big gulp of current when starting. Overloads make them blow fuses, dim lights, or even burn out. A centrifugal clutch instead of a plain pulley on such a motor lets it start freely, and shoulder the load when under way and able to do so.

A clutch may enable you to make do with a smaller—and cheaper—motor than would otherwise be needed. If a large motor dims lights or blows fuses on starting, or an undersized one labors heavily to get going, an automatic clutch may be the answer. It will also serve notice of momentary overloading (taking too heavy a cut on a power saw, for example) by declutching. Remember, though, that a clutch will boost only the motor's starting ability, not its full-load or running capacity.

Low line voltage, which makes motors hard to start under load and is a cause of burn-outs, is another good case for using a clutch. It minimizes the troublesome starting drain.

During a hurricane that downed electric lines, a home owner found his gas furnace useless because the circulating blower was motor-driven. His 700-watt emergency generator would not start the split-phase motor. But with a centrifugal clutch on it to ease the starting burden, the generator got the motor up to speed, then handled the running load easily.

Changing drive ratios is the function of ingenious transmission pulleys. These too have sliding flanges, which move apart to drop the belt to a smaller diameter for heavy loading, or move in, shifting the belt to a larger diameter, as the engine speeds up in easier going.

Some of these pulleys act as a clutch besides—they open wide enough to let the belt ride free between the flanges. Others do not, but keep the belt pulling even at low shaft speeds.

One popular clutch-transmission unit has a shift range of only 1.6 to 1. But in conjunction with the usual second reduction step in a riding tractor or small car, this provides a very effective ratio change. If, for example, the countershaft has a 5″ driven pulley and a 1 to 4 ratio to the drive wheel, the overall ratio will vary from 1:10 in "low" to 1:6.2 in "high".

Since the effective pulley size varies,

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SEE PAGE 178 FOR ALL SPLIT-LEVEL CONTEST DETAILS

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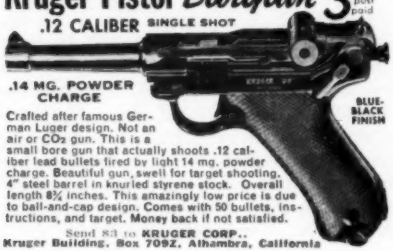

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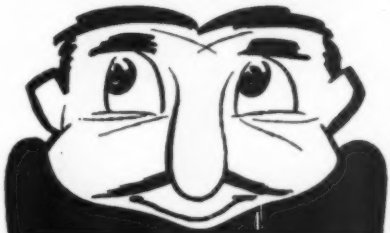
Send $3 to **KRUGER CORP., Kruger Building, Box 709Z, Alhambra, California**



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Sign Of A Good Paint Store. Buy paint only where you see one of these red machines. It's a Red Devil Paint Conditioner and for it the dealer paid about $150 so he can shake your paint into factory-fresh suspension to save you stirring—or blend colors to your taste.

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New Clutches for V-Belt Drives

you need either a spring-tensioned idler to keep the belt taut, or better yet a swinging countershaft. As shown in a drawing, this must pivot on the output shaft to maintain correct spacing for the second drive belt or chain. The point at which ratio shifts occur can be varied by altering the spring tension.

A more costly type of transmission unit consists of two pulleys. One has a shoe-type centrifugal clutch plus a weight-controlled variable-diameter sheave. The other is a spring-loaded variable pulley that opens or closes to compensate for changes in the centrifugally governed one. These units afford a very considerable stepless ratio range—from 1:3, for example, to 1½:1. Driving from an 1,800-r.p.m. source, you could have an output of from 600 to 2,700 r.p.m.

Where a clutch is not needed, good manual ratio control can be had with a moderately priced pulley having interlocking flanges under spring tension. There is no centrifugal action; the pull of the belt determines the diameter on which it rides. This is altered by moving the motor, usually on a sliding or rocking mount.

Another type of variable pulley has internal cams. Driving torque makes these force the flanges together, maintaining belt grip even on overloads. Ratio is altered by moving the driving or driven unit.

Two such pulleys mounted on a countershaft between motor and load afford a still wider ratio choice. The countershaft being adjustable as to position, it shortens the distance for one belt (which will climb to a higher diameter) while lengthening that for the other (which will shift down). With such a setup, maximum speed may be five times the minimum.

Sharp turns can be made with two-wheel drive on small vehicles equipped with a dual transmission unit. This provides clutch action, a modest 1.6:1 automatic ratio shift, and differential action. It consists of two centrifugal clutch-transmission units back to back. Mounted on the engine shaft, these drive separate countershafts through twin V belts fitted with spring-loaded idlers. A chain or belt runs from each countershaft to its wheel.

On turns, road friction slows down the inner wheel. The heavier belt pull shifts

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New Clutches for V-Belt Drives

down the engine sheave to a smaller diameter, letting that wheel turn more slowly than its mate. Spring-tensioned idlers keep the primary belts taut.

Install them with care. Automatic drives are no cure for sloppy belt fits or misaligned pulleys. Remember that centrifugally controlled devices must go on the engine or motor shaft, never on a slower-moving one. Don't try to use them on engines with built-in speed reducers.

Belts must be the correct width for the sheaves (usually ½" wide, "A" section). With sliding-flange clutches, the belt should be long enough to slip on and off readily by hand. If floating flanges do not move freely, solvent or penetrating oil may be applied, but never oil friction-shoe clutches.

Most clutch troubles arise from overloading. Be sure to use a clutch rated for the power to be handled. An overloaded clutch will slip, generating heat, which will soon ruin the clutch element whether it is a V belt or lined shoes.

Finally, if you like to start a gas engine wide open, better change the habit. A centrifugal clutch is ingenious, but it's not smart enough to know whether it's taking off with or without you.

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THE flexible quart bottles in which white plastic glue is packed can be used for storing stock solutions of photo developer temporarily. The pouring spout makes measuring easy. You will find the bottles discarded by many public libraries. To clean them, insert a small rag, two tablespoons of cleansing powder and a little water. Shake vigorously until all traces of glue are removed.

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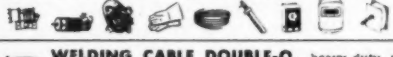
"SUPER 9" 200 AMP WELDING KIT With Deluxe accessories consisting of one 200 AMP. Gen., adjustable helmet, electrode holder, 30' welding cable, rheostat, giant toggle switch, voltmeter, voltage reg., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST — $500. Most items new — all perfect. **$26.00.**



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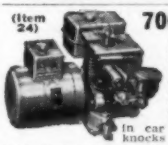

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Detroit's First V-6 Engine

[Continued from page 97]

pectancy usual in truck-engine valves and valve seats due to lack of proper heat transfer, coolant is circulated through cylinder heads at the rate of 120 to 200 gallons per minute—enough to fill a 12-by-27-foot swimming pool in an hour.

Stroke for all four engines is 3.58 inches. The 305 has a bore of 4.25 inches; the 351, 4.56 inches; the 401, 4.88 inches. The V-12 bore is 4.56 inches, same as the 351 V-6.

Similarity of bore size between the 351 V-6 and 702 V-12 is a tipoff to the general interchangeability of the engines. No less than 70 parts are common to all V-6s and more than 50 are common to all V-6s and to the V-12, too. Just two different types of cylinder heads are needed for the entire line, for example—one for 305 engines and the other for the two bigger V-6s and the V-12. They just double up, use four heads instead of two, on the V-12. And its block actually is run down the same line as the V-6s; drilling machines make two passes instead of one to bore out the cylinders.

The engine is smooth. Judging from my experience, GMC has licked the imbalance problem chronically associated with V-6 engines. [PS, Aug. '55]. I had asked Monaghan about this before driving the Suburban.

"That has caused us no difficulty," he said. "We engineered them to minimize imbalance as much as possible. Remember, too, these engines have been designed as truck power plants. There is a lot more structure and built-in rigidity in them to soak up vibration than would be possible in automobile engines."

I wouldn't have been able to tell there was a V-6 and not a V-8 under the hood if I hadn't known in advance. The engine churned without undue shake. There must be some secondary imbalance present, but it doesn't show. It was quiet enough so that maybe Monaghan wasn't kidding with his comment that they might "build a little more noise back into it just to let people know it's working!"

One thing that obviously helps here is that combustion chambers—formed partly in the head and partly cut into the piston top—are fully machined. This insures uniform compression ratios between cylinders and eliminates uneven power

CONTINUED

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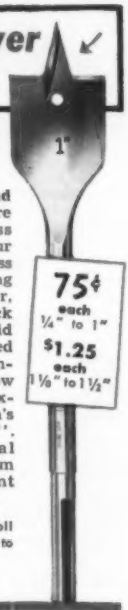

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Detroit's First V-6 Engine

impulses common in simple cast chambers, which often have varying ratios.

High-turbulence combustion-chamber design is also an important factor in the excellent low-speed torque of these engines. The design causes rapid burning of the fuel-air charge early in the power stroke, giving the piston a firm "push" through its full trip down the cylinder.

Low-speed torque of the huge V-12 is especially impressive. Its maximum gross torque of 630 lb.-ft. is developed from 1,600 to 1,900 r.p.m.—and it is not very far from that maximum over a considerably wider engine speed range. The great reserve power will permit use of five-speed transmissions in big tractor-trailer units in place of the usual eight- or 10-speed transmissions. The V-12's ample power will haul trucks up grades at good speeds with a minimum of downshifting, and without holding up long lines of motorists behind.

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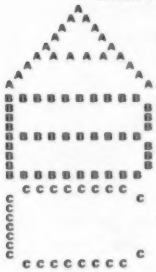

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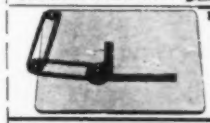

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Has lightweight tubular steel frame. Was designed for British Army. Frame has a canvas covered, folding pack shelf at bottom. Pack is made so weight is carried at hips. Folds flat to store. $25.00 value.

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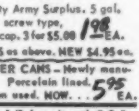

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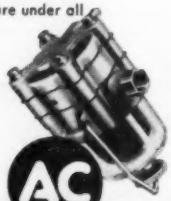

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Stopping the Wave of Bank Holdups

[*Continued from page 70*]

sults. Exact words, names used if there were more than one robber, mannerisms, unusual features, the written note—these are now believed much more important than estimates of weight or height.

There are certain gimmicks that some tellers can use, too:

- Dummy money. This consists of real bills at top and bottom of a phony wad, in a special place in the cash drawer. Some officials think this can be risky if the robbers are pros.
- "Dead" money. Most stickup men don't want large-denomination notes, so they often specify "fives, tens, and twenties." What they don't always know is that more and more banks record series and serial numbers on packs of small bills. Such records are fine evidence if the bills are found on a robber.
- Private codes. A key word or gesture can tip off an adjacent teller that a holdup is in progress. Many banks encourage employees to work out codes.

Catching early birds. To frustrate the early-morning holdup—a favorite tactic against suburban banks—the experts advise a fixed, unvarying procedure at opening time. An arrangement may be made, for example, for a shopkeeper in the neighborhood to call the bank every morning just before opening. The bank official who answers the call repeats a standard formula, such as: "This is the So and So Bank, good morning." If he changes so much as a word in the routine, it's a signal to bring the cops quick.

Employees are often instructed never to admit a stranger to the bank just before opening time. The rule is supposed to apply even if the stranger is accompanied by an employee—who could be a captive. Similar rules prohibit the admission of strangers uniformed as mailmen, delivery agents, or repairmen.

The bank-robbery wave hasn't been all one-sided. One teller defeated a robber by quick wit. When the jittery crook demanded money, he replied, "But I'm a note teller. You'll have to go to a paying teller." The man bolted.

And then there was the woman teller who was threatened by a man who said he had a gun. "Show me the gun," she said. "No gun—no money!" Taken aback by this feminine logic, he fled.

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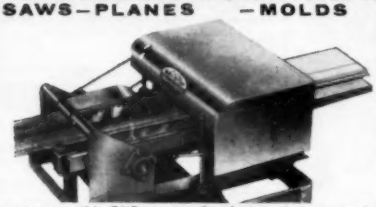
SAWS—PLANES —MOLDS



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• 80-to-1 gear reduction unit. 8 roller bearings, multiple gears. Reduces standard motor to 21 rpm—increases torque. Shafts ⅜" input, 1¼" output. Power winches, revolving signs, door openings, etc. Govt. cost $66. SALE .....**$8.49** Ppd.

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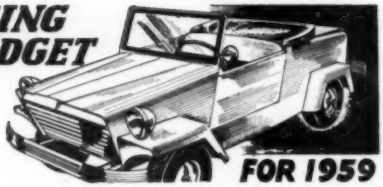

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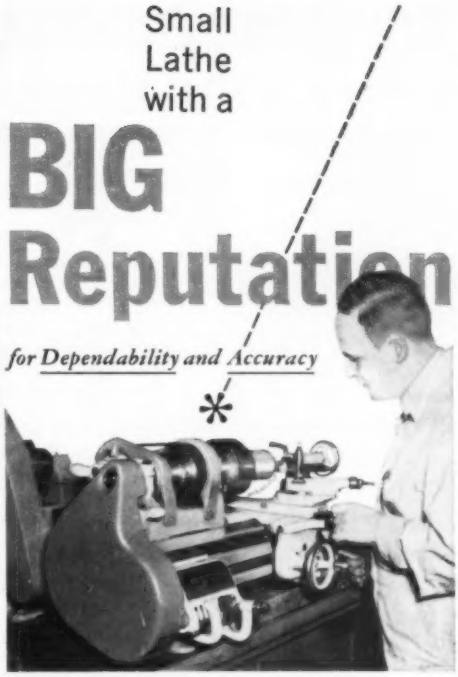

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ACID-DESTROYING PROPERTIES	COMPLETE	No effect	No effect	No effect

★ From independent tests by The Carlson Laboratory.

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Do "Extinct" Animals Still Survive?

[Continued from page 88]

"coating of dried serum [blood] was still preserved on the cut edges." But this was 60 years ago, and, to date, no one has brought home a neomylodon.

Nor has anyone brought back alive one of the super-anacondas of Brazil—said to run to 150 feet in length. But Father Protesius Frickel, a Franciscan priest at Oriscima, Brazil, studied one and reported that its eyes were "as large as plates." And another, an estimated 115-footer, was photographed as recently as 1948, after machine gunners had spent 500 bullets killing it. Its picture taken, the giant snake was casually rolled back into the river whence it had come. No one knew of its rarity.

Does the hairy mammoth still exist? The natural deep-freeze of Siberia has enabled scientists to study the mammoth more closely, perhaps, than any other fossil creature. Several have been found, perfectly preserved as they were in life many thousands of years ago, in giant ice cubes.

No one really knows what caused the mammoth to disappear. As the Ice Age melted into time and the glaciers retreated, the mammoths—adapted by their long, hairy coats only to cold—were backed up into the Siberian tundras. And then they were seen no more.

But Heuvelmans thinks they may just still be around—but in the forests instead of on the plains. He puts a finger on the map where the climate could still support them: It is the unexplored icy heart of the *taiga*—the Northern Siberian forests, largest in the world.

An analysis of the stomach contents of mammoths, he points out, shows that in winter they browsed on the leaves and branches of conifers, arctic willow and other dwarf northern trees—exactly the flora that one finds in the taiga.

Do we know for sure, Heuvelmans asks, that they are not still alive in the taiga? Are we sure that those frozen carcasses were in cold storage as long as some scientists say?

Bird in the bush? Heuvelmans has similar doubts about the demise of the moa, the huge bird that stood—or stands—twice as tall as a man. While no one has reported seeing any moas around for quite a while, several facts support the possibility that they still linger on. There are the native traditions, which give a very detailed picture of the bird. Could they describe a moa unless their not-too-remote ancestors had seen one? Also, on South Island, New Zealand, have been found comparatively fresh remains: mummified remnants of the body and skin, and brownish feathers. Shells have been found, too, of eggs over 10 inches long.

Is the moa only hiding? There is the case of the Bermuda petrel, which science had considered extinct—until, in 1951, Dr. Robert Cushman Murphy of the American Museum of Natural History caught, banded and released five live ones. It may well be like that with the moa, says the hopeful Dr. Heuvelmans.

New Zealand may also conceal a small animal that would, if it exists, effect a revolution in scientific theory. It is the waitoreke—called "impossible" by paleontologists, "existing" by the native Maoris.

If anyone finds one of the creatures, especially a female, Dr. Heuvelmans would like him to examine it closely and let him know whether it has teats. If it has, many textbooks will have to be junked. For teats would make the waitoreke a mammal—the only one in New Zealand—and all our geographical theories about how and when New Zealand and Australia were connected will have to be revised. "The date of submergence of certain continental bridges would have to be changed by several tens of millions of years," Dr. Heuvelmans says—if the Impossible Waitoreke has teats.

How much skepticism should one bring to native legends? Capt. William Hichens, an Englishman who had expressed disbelief in the existence of a great African snake, the "lau," writes:

"Mshengu lived on the southeast side of the Wembare swamps and, as a young man, had traveled and hunted around and over Victoria Nyanza and the Nile swamps. To my suggestion that there was no lau, he said, 'I might have said, as a young man, that there is no such thing as a motor car. I had never seen or heard of one then. But there is your motor car in the sight of my eyes and I have sat on its chairs and heard its bowels digest inside it. It is thus of the lau.' "

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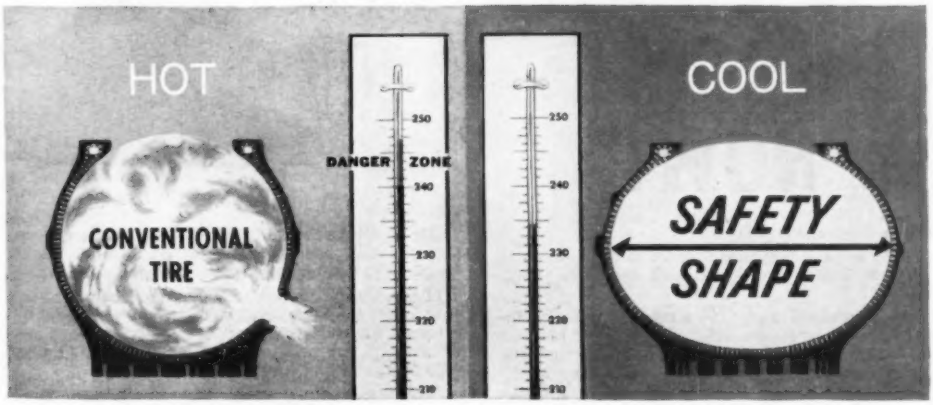

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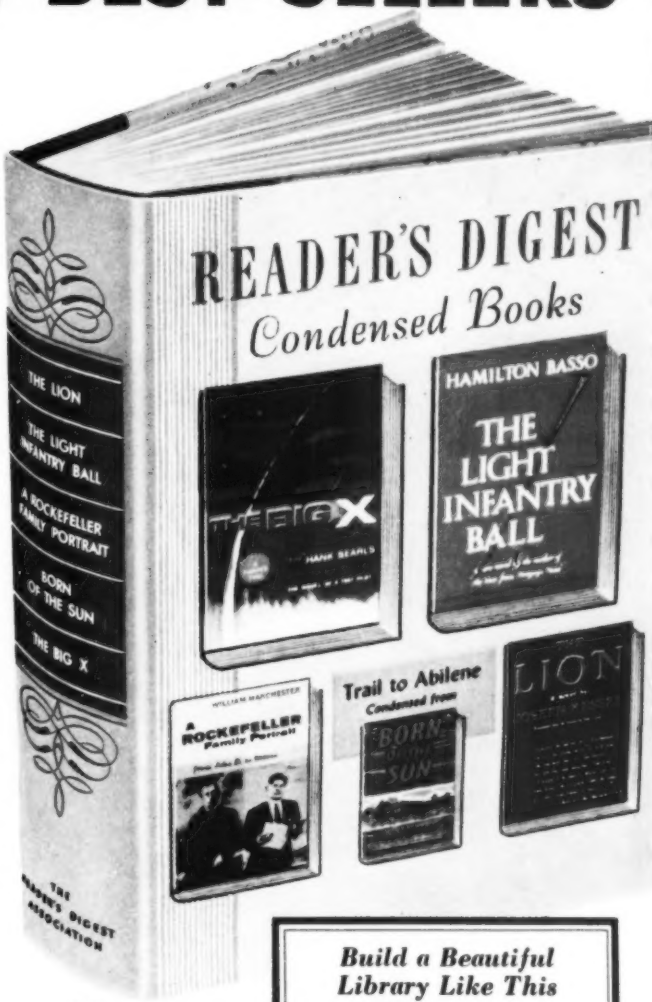

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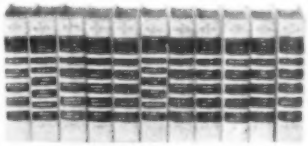

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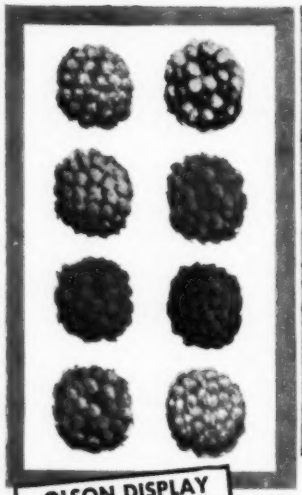

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